Mechanisms of Technology Re-Emergence and Identity Change in a Mature Field: Swiss Watchmaking, 1970-2008

HARVARD | BUSINESS | SCHOOL

Mechanisms of Technology Re-Emergence and Identity Change in a Mature Field: Swiss Watchmaking, 1970-2008

Ryan Raffaelli

Working Paper

14-048

December 12, 2013

MECHANISMS OF TECHNOLOGY RE-EMERGENCE AND IDENTITY CHANGE IN A MATURE FIELD: SWISS WATCHMAKING, 1970-2008

Ryan Raffaelli
Harvard Business School
Organizational Behavior Unit

October 25, 2013

Direct all correspondence to Ryan Raffaelli, Harvard Business School, Morgan Hall 312, Boston, MA 02163, rraffaelli@hbs.edu. I am indebted to my dissertation committee, Mary Ann Glynn, Michael Tushman, Mary Tripsas, and participants in the ABC Institutional Conferences, the Boston College-Harvard Cultural and Creative Industries Working Group, and the Imagine Research Series at Copenhagen Business School for helpful comments and suggestions on prior drafts.

MECHANISMS OF TECHNOLOGY RE-EMERGENCE AND IDENTITY CHANGE IN A MATURE FIELD: SWISS WATCHMAKING, 1970-2008

ABSTRACT

I examine the processes and mechanisms whereby market demand for a "dying" technology re-emerges at a later date. In 1983, fourteen years after the introduction of the first quartz watch, mechanical watches, along with the Swiss Jura community of watchmakers who built them, were thought to be "dead" (Landes, 1983). Unexpectedly, however, by 2008 the Swiss mechanical watchmaking industry had re-emerged as the world's leading exporter (in monetary value) of watches. Using qualitative and quantitative analysis, which I apply to a wealth of data, I show how changes in product, organizational, and community identities associated with a legacy technology can be reconstituted to reconfigure a field. My findings highlight that three mechanisms – identity claims, leadership, and framing (i.e., temporal, linguistic, value) – are core to explaining field re-emergence. Although new or discontinuous technologies tend to displace older ones, legacy technologies that are seemingly "dead" can re-emerge, thrive, and even co-exist with newer technologies. Building on these results, I draw out theoretical and empirical implications that focus on the interface between technological shifts and identity change at multiple levels.

Keywords: identity, re-emergence, technology change.

> **1983:** "Now we bid farewell to the [Swiss] master craftsmen who have brought us these wonders of the mechanical arts. Their time has come and probably gone." (Landes, 1983: 359)
>
> **2008:** "The watch industry is today, as it was yesterday, one of the brightest stars in the Swiss economic firmament. Better still, during the last five or six years, it has taken the leading position amongst the country's most successful industries." (Federation of the Swiss Watch Industry 2008 Annual Report)

Is it possible for technologies within a field or industry to *re*-emerge? Schumpeter (1942) argued that the forces of creative destruction overturn existing market structures and force the dismantling of those technologies, as well as their applications in products, process, and practices (Abernathy, 1976). Tushman and colleagues have shown how industry evolution is linked to technology cycles (Anderson & Tushman, 1990; Tushman & Rosenkopf, 1992) whereby a dominant technology is displaced by a new technology that, in turn, initiates a new cycle. The effect is a clarion call of sorts: "The (old) technology is dead! Long live the (new) technology!"

The prevailing theorization emphasizes technological displacement, assuming that old technologies disappear when newer ones arrive. And yet, as the opening quotes illustrates, this may not always be the case, as market demand for old technologies may wane only to emerge again at a later point in time. This seems to be the case for products like fountain pens, streetcars, organic winemaking, and vinyl records, which have recently rematerialized to claim significant market interest. I seek to examine a possibility that has largely been overlooked in the literature, that displaced technologies may not die away (Adner & Snow, 2010), but persist in some generative form that can permit "re-invention" (Rogers, 1995: 107): "The dying technology provides the compost, which allows its own seeds, its own variants, to grow and thrive" (Tushman & Anderson, 1997:12). I seek to understand the underlying dynamics of technology re-emergence and, especially, the mechanisms whereby this occurs in mature fields. I ask, *how, when, and why does market demand for a legacy technology re-emerge?"* More

specifically, I focus on identifying *mechanisms of identity change associated with the re-emergence of market demand for a legacy technology*.

My research setting is the Swiss watchmaking industry from 1970 to 2008, an opportune context because it was considered to be the premier symbol of technological supremacy and innovation for several centuries (Glasmeier, 2000; Sobel, 1996). Swiss watchmakers dominated the industry and the mechanical watch movement for nearly two centuries (Donze, 2011), beginning in the mid-18th century. Their rein abruptly ended in the mid-1970s, at the onset of the "Quartz Revolution" (or "Quartz Crisis"), and with the expectation that the quartz movement would displace the mechanical. The Swiss dropped from holding 55% percent of the world's export market (in monetary value) to roughly 30% a decade later; in export volume, the decline was also staggering, decreasing from 45% to 10% of watches produced globally (Glasmeier, 1991: 477). By 1983, two-thirds of all watch industry jobs in Switzerland were gone (Perret, 2008).

Quartz technology seemingly shifted watch production and caused "the Swiss to [pay] dearly for their slowness to adopt the new technology" (Landes, 1983: 353). In 1983, scholars and industry analysts predicted that mechanical watches, along with the Swiss communities of watchmakers who built them, would disappear (Donze, 2011; Landes, 1983). Quite unexpectedly, however, Swiss watchmaking, led by the production of mechanical watches, resurged and by 2008, re-emerged as the world's leading exporter of watches and reclaimed 55% of the total export value in the global watch industry. Figure 1 depicts these shifts over time.

Insert Figure 1 Here

I focus on this period of re-emergence in Swiss mechanical watchmaking, and how technology precipitated changes not only in Swiss watchmaking, but also in the product identity of the watch, the organizational identity of the watchmaking firms, and the collective identity of those craftsmen who designed and valued them. I show how the product identity of the watch moved through phases that emphasized different identity attributes: from precision craftsmanship, to fashion accessory, and finally to luxury good. Concurrently, I examine how the identity of the Swiss watchmaking community also experienced significant change, as master craftsmen were forced to evaluate their centuries-old profession in light of the electronic quartz watches that had claimed a significant portion of their industry. Like Tripsas (2009: 442), I observe that "technology change has implications beyond the technology itself." The overall effect of the Quartz Revolution was to loosen the identity coupling – between product (mechanical watch), organization (watchmaking companies), and community (Swiss) – paving the way for a plethora of innovative watches that were produced by new and different communities of watchmakers, including the Japanese and Chinese. That technological shifts ushered in identity and field-level change is perhaps not a surprise (Barley, 1986); what is a surprise, however, was the potent re-emergence of the "dying technology" of mechanical watch movements along with the re-coupling of watch and (Swiss) community. My research joins recent inquiries into processes of field emergence (e.g., Navis & Glynn, 2010; Tripsas, 2009) and extends this line of work to reveal that field *re*-emergence is not only possible, but importantly linked to identity change.

This paper is poised to make several contributions. First, because I examine how fields can be reconstituted through technology, I complement and extend existing research on the dynamics of field birth and death. My research reveals that technology cycles may be more

expansive than previously modeled, lengthening beyond birth (technology emergence) and death (technology displacement) to re-emerge. Thus, I contribute to research on innovation and innovation cycles (Tushman & Rosenkopf, 1992), highlighting *how* legacy technologies (i.e., old technologies that endure after the rise of a dominant substitute (Adner & Snow, 2010)) embedded within mature fields can, counterintuitively, survive periods of ferment and the threat of displacement to reconfigure the field, as well as its key products and actors.

Second, I highlight *how* the processes that underlie field-level changes are predicated not only on technology shifts, but also upon mechanisms related to identity. My archival analyses reveal that such mechanisms use temporal references, metaphorical language, and symbolic claims in public and marketing communications to re-define legacy identities. I show how industries and fields can be reconstituted such that technologies – and associated product, organization, and community identities – can re-emerge as influential and powerful collectives.

Third, I answer calls for integrative research that encompasses micro- and macro-level processes of change, innovation (Drazin et al., 1999) and institutionalization (Powell & Colyvas, 2008), by exploring how the reclamation of legacy identities (Walsh & Glynn, 2008) in products, organizations, and communities reshapes fields.

I begin with an overview of the relevant literature theorizing product, organizational, and community identities within the context of technological re-emergence. Next, I present research that uses archival analysis and field interviews to reveal the mechanisms of technological re-emergence of Swiss watchmaking during the period of 1970-2008. Finally, I extract theoretical and managerial implications, and suggest potential directions for future research.

TECHNOLOGICAL RE-EMERGENCE AND FIELD LEVEL IDENTITY CHANGE

Scholars have modeled technological evolution as a cyclical process, i.e., a *technology life cycle*, that is initiated by the introduction of a new and discontinuous technology, ushering in an era of ferment that persists until the industry coalesces around a new technology (Tushman & Rosenkopf, 1992). The cycle repeats itself over time as a "highly path dependent process" (Kaplan & Tripsas, 2008: 790). The apparent pro-innovation bias (Rogers, 1995) seems to have deterred attention to the possibility that legacy technologies may endure beyond the life cycle model. The underlying assumption is that technologies eventually reach a natural limit (Fleming, 2001), leading to their demise (Klepper, 1996). Foster argues (1986: 160), "The market served by the old technology will be small, have no growth… and only a few firms will be economically strong enough to weather the storm."

Nonetheless, there is some evidence to challenge the assumption that old technologies inevitably die when they are displaced by newer ones. Adner and Snow (2010: 1655) theorize that old technologies may avoid extinction by exploiting "racing" strategies (i.e., extending their performance) or "retreat" strategies (i.e., moving into a niche or relocating into a new market application). Henderson's (1995) research on the optical lithography industry reveals how a legacy technology was able to extend its dominance beyond its performance limits because of social and institutional factors. Ansari and Garud (2009) show how the life of 2G telephony technology was extended due to modular innovations in packet-switching technology. Snow (2008) and Harley (1971) illustrate how legacy technologies such as carburetors and sailing ships extended their lifespan by adopting components from electronic fuel injectors and steam ships, respectively. Finally, Adner and Snow (2010: 1655) offer a theoretical explanation for the life

extension of old technologies, arguing that the emergence of a new technology can "reveal significant underlying heterogeneity in the old technology's broader demand environment." However, we know little about the micro-processes and mechanisms that undergird the communities and organizations that attempt to preserve legacy technologies, nor has significant attention been given to cognitive factors (Kaplan & Tripsas, 2008) that may potentially affect the trajectory and market demand for a legacy technology beyond the limits of the its "ultimate performance" (Henderson, 1995: 631).

To address these gaps in the technology literature, I turn to the identity literature, which scholars (e.g., Tripsas, 2009) suggest holds promise for unpacking some of the cognitive elements associated with technology change. Identity focuses on the attributes of entities of multiple types, including products, firms, communities, and fields, and how they are framed and understood. I discuss how such factors inform our understanding of how legacy technologies re-emerge and re-establish themselves in a mature field.

Identity Change in Products, Organizations and Communities within a Field

Identities, at the levels of the organization or field, consist of elements that collectively define "who we are" and "what we do" (Navis & Glynn, 2011: 479). In the process of technology emergence, these identities, as well as those of marketplace products, are intertwined and mutually constituted. Over time, however, the initial coupling between them tends to loosen, with technical elements defining "what we do" potentially separating from institutionalized meanings of "who we are." As Scott (1987: 499) explains: "Institutional elements of environments begin to be defined in contrast to technical elements, and this definition becomes more explicit and pronounced over time." Thus, it is the "common meaning system" that Scott (1994) attributes to fields that gives them their collective character, beyond their mere technical

features. Meanings, which are socially constructed (Berger & Luckmann, 1967; Kennedy, 2008; Rosa et al., 1999), shape the collective identity of the field. They serve as a touchstone that firms use to claim field membership and that audiences use to understand, categorize, and legitimate the field (Navis & Glynn, 2010; Weber et al., 2008; Zuckerman, 1999). Below I describe how the identity of product, organization, and community change with regard to technology re-emergence.

Product Identity

Product identity is defined as the unique attributes of a product's architecture, design, and function (Ulrich, 1995). Features of product identity are based on the arrangement of the product's functional elements, the link between its functional elements and physical components, and, finally, the interfaces among its interacting physical components (Urlich 1995: 420). Bayazit (2004: 16) argues that product identity is "concerned with the physical embodiment of man-made things, how these things perform their jobs, and how they work."

Recently, scholars have begun to investigate product design (for a review, see Ravasi & Stigliani, 2012) and organizational identity (e.g., Ravasi & Schultz, 2006; Tripsas, 2009). Although advocates claim that "design-inspired" products are more enduring and profitable, the concept of design and its integration with organization identity has received little scholarly attention (Utterback et al., 2010: 3). Ravasi and Canato (2010) posit that the technological features of a product become cognitive anchors that provide meaning and reinforce individual and organizational identities; thus, product identities are the physical manifestation of that which is core, distinctive, and enduring (Albert & Whetten, 1985) to an organization or a wider collective. As the case of Polaroid described by Tripsas and Gavetti illustrates (2000), the

entrenchment of a product identity within an organization may inhibit the organization's ability to envision a new identity devoid the core product (Ravasi & Canato, 2010).

In addition to design specifications, product identity serves as a filter on how external audiences, such as consumers and industry observers, perceive and evaluate a specific type of product class, technology, or innovation (Benner, 2010; Zuckerman, 1999). Clark (1985: 245) posits that new product innovations require manufacturers to define the product identity using broad categorizations, and that consumer adoption decisions require a "conceptual evolution" as consumers become experienced with the product. For example, the "horseless carriage" gradually became known as an "automobile" as consumers developed more experience and were able to define the car's unique identity. Benner and Tripsas (2012) show that the prior history of firms entering an emerging field influences their initial framing of product identity (e.g. a digital camera ranged from an analog camera substitute for photography firms, to a video system component for consumer electronics firms, to a PC peripheral for computing firms). Eventually, they find the entire field converged on a common product identity.

Product identity is also shaped by audience expectations of the product class. Scholars have shown how industry analysts and investors often struggle to define new and existing product identities because they do not know how to categorize the product's attributes within the context of institutional norms (Benner, 2010; Zuckerman, 2000) or by analogy, to other products' attributes (Navis & Glynn, 2010). For example, Hargadon and Douglas (2001) examine how Thomas Edison attempted to define the attributes of electric lighting by exploiting prior representations of lighting established by the gas industry.

Product identities, defined by attributes such as architecture, function, and form, are all affected and can change the boundaries around existing product classes or draw boundaries

around new ones. While product identities are tied to functional aspects of the technology, they also serve as material and symbolic elements of identity for the organizations and individuals who produce and purchase them (Dittmar, 1992). As such, the re-emergence of market demand for a legacy technology may be possible if it continues to hold value or significance as an identity marker (Pratt & Rafaeli, 1997) to actors in the field. Following this line of thought, I hypothesize that:

> *Hypothesis 1: Product identity redefinition is associated with the re-emergence of market demand for a legacy technology.*

Organization Identity

Organizational identity is anchored to the categorical question of "What kind of organization is this?" (Albert & Whetten, 1985) and claims to what is *core*, *distinctive*, and *enduring* about the organization. Over the past twenty years, a common thread of debate among scholars has centered on where organizational identity resides (Ravasi & Canato, 2010). Whetten and Mackey (2002: 395) suggest that scholars have developed two fundamentally different conceptions of organizational identity: 'identity *in* organizations' and 'identity *of* organizations.' They claim, "At the heart of these competing conceptions of organizational identity is the distinction between identity-as-shared perceptions among members versus identity-as-institutionalized claims available to members."

These conceptions of organizational identity are apportioned by a focus on identity as 'attribute-based' versus 'identity as a strategic resource' (see Glynn, 2008: 416-417 for an overview). The first conceptualization assumes certain attributes are essential to the organization and ask how they evolve over time (e.g., Gioia, Schultz, & Corley, 2000; Meyer, Bartunek, & Lacey, 2002; Ravasi & Schultz, 2006). Several studies reveal the inherent tension organizations face in maintaining a distinctive identity while also attempting to position themselves in larger

classification schemes (Albert & Whetten, 1985; Navis & Glynn, 2010); for example, Deephouse (1999: 147) argues that organizations should be "as different as legitimately possible." Alternatively, organizational identity can also serve as a strategic resource, "being deployed to competitive advantage and functioning as a guide to firm-decision making and strategic choice" (Glynn, 2008: 416).

Organizational identity becomes particularly salient during periods of instability and change (Gioia et al., 2000) and is a product of social construction (Corley et al., 2006). It has been shown to present itself in the face of conflict (Dutton & Dukerich, 1991), within shared interpretive schemes that provide meaning to individuals (Fiol, 1991; Gioia, 1998), amongst networks or relationships (Mehra, Kilduff, & Brass, 1998), in a set of institutional claims (Whetten & Mackey, 2002), within professional groups (Pratt & Foreman, 2000), across functional differentiations (Glynn, 2000), embedded in structures or symbols (Glynn & Abzug, 2002), and through rhetoric and language (Fiol, 2002). As such, questions related to organizational identity become even more salient, for instance, when an organization faces an exogenous shock from the arrival of a discontinuous technology. One could suppose that changes in market demand will lead organizations to incorporate identity elements from the broader community that will allow for their survival. Simultaneously, such changes might be facilitated by organizations reclaiming elements of their historical identity anchored within a specific temporal frame (Schultz & Hernes, 2012; Walsh & Glynn, 2008) and tied to a legacy technological order. Thus, I hypothesize that:

> *Hypothesis 2: Historical organizational identity reclamation is associated with the re-emergence of market demand for a legacy technology.*

Community Identity

Community identity[1] refers to the collective identity (Snow, 2001) that characterizes the field as a whole, and is claimed by field members in an effort to align with others' expectations (Mervis & Rosch, 1981; Navis & Glynn, 2010). Cornelissen, Haslam, Balmerw (2007) argue that collective identities are distinct and fluid, organized around a common purpose and shared action, and serve as the basis for material outcomes and products. Hoffman and Ocasio (2001: 416) posit that collective identities within the same industry are defined by "the common rules, values, and systems of meaning by which industry participants establish rules of inclusion, competition, and social comparison among industry members; create distinctions within and between industries; and delimit industry boundaries."

Communities are largely defined by structural and cultural components that create the meanings of social systems and are exhibited as standard practices (e.g., Baron et al., 1986) and as the collective identity of the community (Wry, Lounsbury, & Glynn, 2011). In their study of Scottish knitwear manufacturers, for example, Porac, Thomas, and Baden-Fuller (1989) show how actors who share a collective identity develop "cognitive communities" that help them determine the competitive boundaries of who sits within their competitive environment. More recently, scholars have explored how community identity plays a critical role in category emergence and classification. Navis and Glynn (2010) highlight the role of collective identity as a source of legitimacy in their study of the emergence of the satellite radio market category; alternatively, Benner (2010) and Zuckerman (2000) find that firms that fall outside the definition of the community identity will suffer in terms of external evaluations.

[1] For the purpose of this paper, I use the terms 'collective' and 'community' identity interchangeably, suggesting that both refer to the shared sense of "we-ness" (Snow, 2001) inferred by both terms. While collective identity has been shown to exist among individuals within an individual organization (e.g., Fiol & Romanelli, 2012), I draw on work that explicates the relationship between collective identity and fields (e.g., Glynn, 2008). I use the term to describe a shared collective identity between actors who interact more "frequently and fatefully with one another than with actors outside of the field" (Scott 1994:207).

Collective and community identities also characterize fields and institutions, which themselves are made up of regulative, normative, and cognitive structures and activities that provide stability and meaning (Marquis et al., 2007). Regulative processes establish rules, ensure conformity, and define sanctions; established norms become an obligatory dimension of social life; and cultural-cognitive understandings constitute the nature of reality and the frames through which meaning is made (Scott, 2008: 33).

Reinforcing cultural-cognitive systems are structural systems of relationships, networks, coalitions, and coordination mechanisms. DiMaggio and Powell (1983) show how members of a community are defined by mutual awareness that they are involved in a common enterprise. Goffman (1974: 21) argued that communities form similar cultural frames that allow individuals to "locate, perceive, identify, and label" events and other stimuli as a way of establishing a sense of shared meaning (Scott: 2008: 187). Greenwood and Hinings (1988: 293) posit that organizations and communities "operate with structural designs which are given meaning and coherence by underlying interpretive schemes." And Fligstein (1990) suggests that organizational communities are defined by shared relationships with similar organizations or by a common relationship with a particular institution. Although relational and cultural-cognitive systems can define and stabilize identity, they can also be challenged by technological change that redefines fields. In this regard, several scholars have explored how communities react to a discontinuous technology (e.g., Kaplan, 2008; Tripsas & Gavetti, 2000; Tushman & Anderson, 1986). Thus, the role of collective identity in the process of technology re-emergence appears particularly salient, especially since the collective identity associated with a legacy technology may not completely go away (Walsh & Glynn, 2008). One could imagine that the activation of a

dormant collective identity associated with a latent technological order might be associated with the re-emergence of market demand for a legacy technology. Consequently, I hypothesize that:

> *Hypothesis 3: Changes in community identity that reshape systems of meaning are associated with the re-emergence of market demand for a legacy technology.*

Mechanisms of Field Level Identity Change

Davis and Marquis (2005) suggest that the utility of a mechanism-based approach is that it describes a set of interacting parts that produce an effect not inherent in any one of them. Ironically, they (2005: 336) offer an analogy well suited to this study: "If a regression tells us about a relation between two variables—for instance, if you wind a watch it will keep running—mechanisms pry the back off the watch and show how." My analysis explores three unique mechanisms that underlie *how* product, organization, and community identities interact during periods of field evolution and technological re-emergence.

First, research has highlighted the importance of temporal frames, especially ones that help actors re-interpret the past in light of the future, during periods of category development, evolution, or expansion (Navis & Glynn, 2010). One could suppose that temporal frames might serve as an important mechanism of technology re-emergence, especially if notions of the past must be reestablished in order to create a bridge to the future.

Second, metaphors have been shown to serve as a mechanism that helps actors create new labels and meanings during periods of change and evolution (e.g., Clark, 1985; Gioia et al., 2000; Powell & Colyvas, 2008). As Cameron (1986: 540-541) points out, "the usefulness of metaphors lies in their possession of some degree of falsehood so that new images and associations emerge." One could therefore imagine that metaphors would be an especially relevant mechanism to facilitate new conceptions of product, organization and community identities during a period of market and technological ferment associated with re-emergence.

Third, research has found that symbolic identity claims help organizations gain or maintain membership in specific communities (Albert & Whetten, 1985), particularly when managing strategic change (Fiss & Zajac, 2006). For example, Albert and Whetten (1985: 270) posit that symbolic identity value claims require the organization's "choice and modification of symbols, such as logos and sales slogans, product packaging, and the location and appearance of the corporate headquarters." One could suppose, therefore, that symbolic and material value claims by organizations and communities during a period of technological re-emergence would be especially important for redefining how consumers and other actors assess the value of their products. Thus, I investigate the following hypotheses:

> *Hypotheses 4a-c: Identity change associated with the re-emergence of market demand for a legacy technology is facilitated by mechanisms of: a) temporal framing to anchor practices and activities in the past, present or future; b) linguistic framing to shape preferred meanings through metaphors; and, c) symbolic framing to reshape how value-claims are interpreted and evaluated by actors in the field.*

METHODS

Empirical Setting

The field of Swiss watchmaking, in the years between 1970 and 2008, provides fertile ground to explore the mechanisms of technology re-emergence. Several scholars have documented the decline of the Swiss watch industry after the introduction of quartz technology (e.g., Donze, 2011; Glasmeier, 1991; Landes, 1983; Moon, 2004; Tushman & Murmann, 2002); the watch industry has almost become a *de facto* example of technological displacement and the impact of a competency destroying innovation (Glasmeier, 1991; Lecoq, Maillat, Nemeti, & Pfister, 1995; Tushman & Anderson, 1997). However, few organizational scholars have extended this line of research to examine how the Swiss repositioned themselves in the decades that followed the quartz crisis (for one notable exception, see Tushman & Radov, 2000).

Although the Swiss were never able to reclaim the distinction of producing the most units sold (a title claimed by Japan and then relinquished to Hong Kong in the 1980s and 1990s, respectively), the Swiss mechanical watch industry moved further into a luxury niche (Pasquier, 2008; Trueb, 2005) where steady increases in the average price of the mechanical watch facilitated their dramatic re-emergence (Federation of the Swiss Watch Industry, 2009). See Figure 2.[2]

Insert Figure 2 Here

The year 1970 was selected as the starting point of this study for three reasons. First, 1970 marked the year after the first quartz timepiece was introduced on the market, providing a baseline to examine how quartz technology impacted the field of watchmaking from its inception. Second, 1970 represents the height of the Swiss watchmaking industry's dominance over world markets (in units sold and value) prior to the introduction of quartz technology. Finally, starting in 1970 will allow me to track over a decade of performance data, events, critical decisions, and identity claims that occurred before the Swiss watchmaking industry reached its lowest performing years in the early 1980s after the introduction of quartz technology. It is not until 1983 that Swatch introduced its first line of quartz watches and, with it, a dramatic shift in watchmaking; thus, this functions as a potentially important inflection point in the evolution of the field and affords a window on identity shifts that led to its re-emergence.

The year 2008 was chosen as the ending point of the study because it marked the beginning of a global financial system downturn, which many watch industry experts have now

[2] Global watch production figures and exports values do not exist for the watch industry as a whole since 1995. The industry can only estimate approximate global sales and production based on intermittent reports issued by some of the main export countries. An economic official at the Federation of the Swiss watch Industry, explained: "Missing data, rough estimates from certain producing countries, changes in product mix and the list of producing countries" prevent them from reporting global data (personal communication, 10/17/2011).

dubbed a "crisis" that affected previous growth patterns. Thus, changes in industry performance trends and firm activities in response to the 2008 crisis suggest that several exogenous macroeconomic factors began to impact the industry in 2009 in ways that extend beyond the scope of this study.

Between 1970 and 2008, I focus on the three distinct periods defined by different dominant attributes associated with the product, organizational, and community identities associated with the field of Swiss watchmaking. These periods can be described in terms of the extent to which identities were focused on: 1) watches as *Precision Craftsmanship* (pre-1983); 2) watches as *Fashion* accessories (1983-89); and 3) watches as *Luxury* items (1990-2008).[3]

Data Sources

I collected data from multiple sources, following what Creswell (2003) termed a concurrent triangulation strategy, whereby multiple methods, data sources, and units of analysis are used to evaluate a set of theorized relationships within a single study (e.g., Navis and Glynn, 2010). I did this for two reasons: first, to construct a narrative history of the focal period to observe the trends and, second, to suggest potential markers for the variables that I use to empirically examine my hypotheses. Below, I describe each of my data sources.

My primary data source consists of advertisements from the three most prominent watch industry trade journals between 1970 and 2008. My original sample consisted of 845 advertisements, which I collected from horological archives and libraries located in the United States and Switzerland. I found that 700 were for Swiss watch companies, which make up my

[3] I developed labels and timelines for each of the three periods (i.e., precision craftsmanship, fashion, luxury) based on extensive interviews and archival research. Although there are no formal agreed upon labels or dates to demarcate each of the periods within the industry, I relied on critical events, regional sales and employment data, and industry reports to help create the labels and demarcate the associated dates. My interviews with watch executives and industry experts provided verification and affirmation of these period labels and timeframes.

final sample for this paper. I examine product, organization, and community identity claims that the companies made before, during, and after the introduction of the quartz watch. See **Error! Reference source not found.** for illustrative examples of advertisements. The main data source for the advertisements is the *Journal Suisse D'Horlogerie* (JSH), published in Switzerland for both French and English speaking audiences, in both languages. From its inception in 1876, JSH had been the foremost authority for reporting industry trends, field configuring events (Lampel & Meyer, 2008) and new innovations related to the watchmaking industry. The journal's readership consisted of all members of the watchmaking industry, including: watchmakers, watch and jewelry dealers, parts suppliers, consumers, and watch enthusiasts. I also used the journal to examine industry announcements, trends, and innovations. The journal suspended publication in 2000.

Since no one journal ran the entire length during the period of my study, I relied on two additional leading watch journals, *Chronos* and *International Watch (iW)* for the remaining years of analysis. *Chronos* was first published in 1993 and *iW* began in 1989. I chose these two journals after interviewing numerous industry experts, historians, and company CEOs about which journals played a similar role in the watch industry as JSH after its end of publication. Also, to ensure the composition of advertisements in my sample remained consistent across all three journals, I began my analysis of *Chronos* and *iW* in 1996 so that I could verify that no significant differences existed among the three journals during the four years they overlapped in publication.

I also collected archival data from online annual reports issued by the Federation of the Swiss Watch Industry which provided information regarding sales and broad demographic trends for the watch industry. The Federation, dating back to 1876, is a private, professional, and non-

profit association, with over 500 members representing more than 90% of all Swiss watch manufacturers. Additionally, I relied on press releases, annual reports, and Swiss Parliamentary testimony from the Swiss Federal Institute of Intellectual Property, the federal agency for matters concerning intellectual property in Switzerland. Founded in 1888, the Institute is responsible for the "Swissness Project," aimed at sustaining the identity of all Swiss products, but especially watches. Finally, I reviewed 27 archival interviews with Swiss watch CEOs from *TimeZone*, a leading industry news source, and was given access to 145 interview transcripts of CEOs who experienced the quartz crisis, conducted by the industry's leading watch reporter.

To supplement my archival data, I collected a significant amount of primary data to serve as a check on the validity of my archival evidence and to provide additional context for understanding the emerging trends in my data. I conducted 115 informational interviews with watch senior executives, distributors, retailers, industry analysts, vintage collectors, historians, auction house representatives, and museum curators associated with the watch industry. I led 4 focus groups with watchmakers and watch collectors in both Switzerland and the United States (n=50 people), visited multiple watch factories, and attended BaselWorld 2012, the industry's largest annual field-configuring event with over 104,000 visitors, 1,815 exhibitors from 45 countries, and 3,300 journalists. I also observed a course in watchmaking at the *National Association of Watch and Clock Collectors' School of Horology* in order to converse more fluently with watchmakers in Switzerland.

Together, these multiple sources allowed me to iterate back and forth between theory and data, while continually updating my codebook codes and interview protocol questions (see Table 1 for Codebook). The variety of data sources also allowed me to examine how field level identity change was influenced, if at all, by processes of coupling and decoupling between

product, organizational, and community identity during a period of technological change and upheaval in the Swiss watch industry.

Insert Table 1 Here

Analysis

I analyzed the watch advertisements in the journals over time and categorized them into the three identity periods: precision craftsmanship (1970-1982), fashion (1983-1989) and luxury (1990-2008). I manually pulled and hand-scanned every other watch advertisement for every even year between 1970 and 2008. Next, I developed codes to analyze product identity, organization identity, and community identity, along with several mechanisms of change. To test H1, on product identity, I coded each watch advertisement by the technology of the featured watch (0= indistinguishable, 1= explicit mention of mechanical, 2= explicit mention of quartz). To test H2, on organizational identity, I coded each advertisement for company name and whether it mentioned company founding, as a measure of the importance it placed on its legacy heritage (0=no mention of founding, 1=mention of founding). To test H3, on community identity, I analyzed each ad for references to "Swissness" identity claims. For example, I coded ads that made reference to the brand being Swiss either in the text or by prominently displaying "Swiss Made" in the ad photo or graphic (0=no reference to Swiss, 1= reference to Swiss).

Finally, to test H4a-c, I developed codes to examine the mechanisms of identity change, i.e., temporal, linguistic, and symbolic value framing. First, to examine the use of temporal framing (H4a), I coded each ad for references that attempted to link the past with the future (0= none, 1= attempts to bridge the past with the future). Second, to examine the use of linguistic framing (H4b), I coded for the frequency and type of metaphors that described the watch. Third,

to evaluate instances of symbolic value framing (H4c) I coded for value claims that the ads made about the watch (0=no, 1=yes), including: utility or functionality, status or eliteness, and fashionable.

To conduct the analyses, I developed a database that included all the written text of each ad. I initially collaborated with a management professor familiar with the research project and a trained research assistant to conduct a series of pilot coding sessions. We used 100 ads not included in the final sample to assess the validity of the codes and reliability of the codebook. We independently assigned codes to approximately 30 ads at a time and then met to compare scores, resolve discrepancies, and come to consensus; we repeated this process two more times until we achieved roughly 95% consistency, with the remaining 5% due to human error such as mistyping the intended code in the spreadsheet. I then coded the entire sample and hired a trained RA to independently code 10% to verify continued consistency. During the coding process, both the RA and I had access to a copy of the printed ads and the database with the written text from the ad. I used STATA 12 to conduct analyses of variance (ANOVAs) for each advertisement feature over the three periods (Precision Craftsmanship: 1970-1982; Fashion: 1983-1988; Luxury: 1990-2008). For those models that reported significant results, I conducted Tukey HSD post hoc analyses to find posteriori differences among the sample means.

In order to supplement the advertisement data, during field interviews and focus group sessions I asked my interviewees their interpretation of the trends and inflection points in my initial findings, and encouraged them to suggest possible explanations or alternative hypotheses. These responses, along with my other archival data, were used to build a narrative history of the Swiss watch industry and provided additional context for my analysis.

A NARRATIVE HISTORY OF SWISS WATCHMAKING BY PERIODS: PRECISION CRAFTSMANSHIP, FASHION, AND LUXURY

My archival and field research on the history of Swiss watchmaking from 1970-2008 revealed three distinct periods associated with changes in product, organizational, and community identities in the Swiss watch industry, described below.

Precision Craftsmanship Identity (pre-1983). Nearly 400 years ago, the quest to develop an accurate timekeeping mechanism was considered the greatest scientific challenge of the time (Sobel, 1996); for several centuries, watchmaking was considered the premier symbol of technological supremacy (Glasmeier, 2000: 156). Geneva was the first Swiss city to enter the watchmaking trade in the 16th century when John Calvin, the Protestant reformer who came from France and made Geneva his base, outlawed local goldsmiths from making crucifixes and jewelry. Instead, these tradesmen took up making jeweled watches and clocks (Trueb, 2005). A century later, the city's watch industry received an infusion of talent when King Louis XIV expelled the Huguenots living in France; his actions led many of the country's best watchmakers to resettle in Geneva, making it the new hub of the high-end watch trade. As the Swiss watch industry grew, Geneva watchmakers searched for new sources of labor, particularly in other parts of their country; the first was the Vellee de Joux (known originally for its highly complicated watches), who eventually became competitors.

The Swiss rise on the world stage, however, was due largely to the emergence of watchmaking in the Jura mountain region. This snow-capped mountainous territory of Switzerland sits along a trade route between Germany, France and Italy, and was populated by peasant cow farmers who were convinced to use their idle time during the long and cold winters to build watches. Individuals living in the Jura were introduced to the craft by Geneva industrialists and French Huguenots. Although Parisian watchmakers were always considered

the leaders in watch innovation through the 19th century, they relied on the craftsmanship of watchmakers in Switzerland to produce their most intricate and complicated timepieces. Towns in the Jura, such as La Chaux-de-Fonds (now considered the capital of the Swiss watchmaking industry), were also home to iron and brass tradesmen who were well positioned to diversify into the craft of watchmaking. The region focused on precision timepieces at reasonable prices. Landes (1983: 261,263) notes, "The first [Jura] watches were not elegant – that was left to Geneva…The entrance of the [Jura] mountain Swiss was based on the production of cheaper models designed to sell to a wider market." The strategy paid off. By the late early 19th century, Swiss watchmakers had become a serious threat to their French and British rivals.

Supported by the Swiss government, the region continued to grow, sponsoring competitions to motivate watchmakers to design new innovations that would promote the development of even more accurate timepieces. Concurrently, they established institutions that created professional standards, educational settings, and standardized training centers to encourage the dissemination of watchmaking skills within the region (Glasmeier, 2000:100). As a result of these efforts, by 1910 the "Swiss mechanical watch dominated the world watch industry (Knickerbocker, 1974 in Glasmeier, 2000: 105).

Swiss dominance continued through the 1960s, with a continued focus on building more accurate and precise mechanical watches. In 1962, the Swiss introduced a prototype for a watch that used quartz technology, which was unmatched in its ability to maintain accurate time and to use significantly fewer parts than its mechanical counterpart. Although expensive to produce at first, prices fell by a factor of 100 in the 1970s (Trueb, 2005), leading the quartz watch to become the new dominant design for the industry. Quartz watch technology, a "competency destroying" (Tushman & Anderson, 1986) innovation for the Jura mechanical watchmakers, no

longer required the highly skilled mechanical craftsmanship of the Jura watchmaking community to produce. Although the Swiss invented the first quartz watch, they had little interest in re-tooling their production system to accommodate their mass production (Perret, 2008). Additionally, the community of Swiss mechanical watchmakers did not see the quartz watch as an extension of their craft, "remaining largely skeptical… of technology designed by specialists in electronics rather than horologists" [4] (Perret, 2008: 324).

However, due to large investments in building their consumer electronic industry post World War II, the Japanese were able to quickly adapt and produce digital and quartz watches much cheaper and faster than their Swiss competitors. Historians commented, "Swiss performance [had] been weakest precisely in the area of most rapid growth: quartz complicated" (Landes, 1983). Industry analysts coined the term "quartz crisis" to describe the Swiss market during the late 1970s and early 1980s, citing a 60% loss of watchmaking companies in the region during this period and a two-thirds loss of employees (Perret, 2008). While the field continued to focus on precision and accuracy, the Swiss mechanical craftsmen could no longer compete with the Japanese quartz mass production system.

Fashion Identity (1983-1989). Although quartz technology was superior in terms of accuracy, consumers found the lower priced Japanese watches to be aesthetically unpleasing. Additionally, many traditional Swiss manufacturers had no interest in them. Some Swiss organizations responded to the commoditization of quartz watches by shifting the identity of the field of watchmaking from accuracy to fashion. To complete with the new low cost quartz dominant design, the SMH group introduced the Swatch watch, which treated the exterior case of the watch, once a peripheral system, as a core subsystem (Tushman & Murmann, 2002: 332).

[4] A "horologist" is a member of the profession of *horology*, the science of timekeeping.

Scholars and industry analysts have argued that Nicolas Hayek, CEO of SMH, saved the Swiss watchmaking industry by combining quartz technology with "fantasy" and "fashion" (Moon, 2004; Taylor, 1993). Hayek realized that the Swiss could compete with the Japanese by shifting the identity of the field away from precision and towards fashion. He stated, "Fashion is about image. Emotional products are about a message – a strong, exciting, distinct, authentic message that tells people who you are and why you do what you do" (Taylor, 1993: 103).

In the time leading up to the quartz crisis, Swiss watchmakers had been opposed to producing low end watches. A watchmaker working during this period summarizes the general sentiment: "In the 1980s, watchmakers thought that quartz electronic watches were 'beneath them' and 'inferior.' Many times, the watchmakers would say they wouldn't work on quartz watches because they weren't true watches" (personal interview, 2011). But Swatch provided evidence that there was room for Swiss watchmakers to produce products for both the low and high end markets. Swatch production costs were 80% less and used 55% fewer parts than the typical mechanical watch. Driven by quartz technology, Swatches sold at prices low enough so that consumers were encouraged to treat them as fashion accessories. Swatch was first advertised to convey the idea that it could be a "second watch" and attempted to maintain a Swiss identity: "Swatch = Swiss + watch" (Moon, 2004: 5). Although the Swatch plastic case design was not a new technological innovation, it shifted the focus of the Swiss watchmaking industry away from accuracy and towards fashion. In her book, Glasmeier (2000: 25) highlights the importance of Swatch to the re-emergence of the Swiss watchmaking industry:

> Swatch was a Swiss savior in terms of the Swiss industry's return to the low-priced end of the industry and in terms of industry image and morale. Its importance was as much in saving face as in saving the industry itself.

Due to the success of the Swatch brand, the entire Swiss watchmaking industry benefitted from renewed consumer demand for Swiss-made quartz watches (Taylor, 1993). The Swiss industry retooled its production and distribution systems to meet the high demand for large quantities of quartz timepieces (Pasquier, 2008). The fashion period fostered unprecedented levels of growth in the low end Swiss market and convinced other Swiss watchmakers that they could produce watches at multiple price points. By the late 1980s, the field of Swiss watchmaking had successfully shifted its identity from one of precision craftsmanship and towards a newly expanded identity that focused on fashion; in doing so they laid groundwork for the re-emergence of the mechanical watch: "In just a few years Swiss horology switched from the production of fairly standard products to that of products closely linked to fashion and prestige" (Perret, 2008: 305).

Luxury Identity (1990-2008). With renewed confidence, new production and distribution systems, and increased liquidity, the Swiss watch industry began to reinvest in mechanical watchmaking. During the period between 1990 and 2008, Swiss mechanical watchmaking focused heavily on marketing its products as luxury goods (Reardon, 2008). Precision arguments "were completely abandoned, since the use of quartz allowed for constant regularity" (Pasquier, 2008: 313). Rather, mechanical timepieces became "objects of luxury consumption and social distinction" (Pasquier, 2008: 314). For example, Patek Philippe, one of the most successful high-end watchmakers in the world, launched its "generations" ad campaign with the tagline: "You never actually own a Patek Philippe, you merely look after it for the next generation." Other high-end mechanical watchmakers like Rolex introduced campaigns with slogans such as "Class is forever." The successful shift in the broader field level identity toward

luxury led the Swiss watchmaking industry to re-claim the leading position (in market value) for highest value of exports.

Nonetheless, according to a Swiss leading watch expert and historian who experienced the crisis first hand, very few individuals could have predicted how important the shift toward luxury would be for the future of the Swiss industry (Trueb, 2005: 11):

> Hardly anybody had expected what happened next: as the price of quartz movements declined by a factor of 100, beautifully crafted, exquisite mechanical movements came back in favor – and they had to be made in Switzerland. They were something rare and very special: high-tech machinery, almost artistic skills and tremendous experience were required to make, assemble and service them. Damn the wonderfully accurate but mass-produced timepieces: intricate micromechanics are something exclusive and deeply emotional, and only very limited quantities of such timepieces can be produced.

In 2008 the Swiss had firmly re-secured their place atop the world watch market (Federation of the Swiss Watch Industry, 2008). Nearly forty years after the introduction of quartz watch technology, 2008 marked the 19th consecutive quarter of growth for Swiss watch exports. The Swiss watch industry had reported 67% growth over the previous five years, saw numerous new watch companies open in the region, and claimed record sales of $15.8 billion Swiss Francs (its closest competitor, Hong Kong, reported 7.1 billion) (Federation of the Swiss Watch Industry, 2009). In terms of total units produced, world watch production was estimated at around 1.2 billion timepieces in 2008. The Swiss led the high-end segment of the market, producing 26.1 million pieces (of which, approximately 4.3 million were mechanical) and reporting an average export price of a Swiss watch at approximately $563 USD (the average price was $211 for quartz and $2612 for mechanical). Refer to Figure 2 for the average Swiss price per unit value over time. Comparatively, by 2008 the low-end segment, dominated almost entirely by quartz watches, was firmly anchored in Asia, where China and Hong Kong produced

550.3 million and 425.8 million watches, respectively. The average per unit price, however, was $2 in China and $11 in Hong Kong.

Although mechanical watches only accounted for 16.5% of the total number of timepieces, they generated more than 70% of the total value for Swiss watchmakers (Federation of the Swiss Watch Industry, 2009). Again, Trueb (2005:163-164; personal interview, 2012) colorfully describes the unanticipated re-emergence of demand for the Swiss mechanical watch:

> [Nobody] had the guts to predict that the mechanical watch would find a long-term niche in the high end. Why would a sane person spend thousands of dollars for a technically obsolete product that is also expensive to maintain? Yet, this is what millions of people are doing. A choice of this kind is irrational, but we have learned that emotions govern the purchase of a luxury item: the consumer is ready to bleed and suffer for it.

In its annual report, the Federation (2008) summarized the success of the market, "Good results were attributable mainly to luxury [mechanical watch] products."

FINDINGS

Tests of Hypotheses

To determine if there was statistical support for the observed patterns found in my historical analysis of the re-emergence of the Swiss mechanical watch industry, I formally tested the four hypotheses advanced earlier.

Product Identity (H1)

Overall, my findings support hypothesis 1, proposing that product identity redefinition is associated with the re-emergence of market demand for a legacy technology. The frequency of the appearance of mechanical watches in the journal ads followed a U-shaped curve over the three historical periods, and a re-emergence during the luxury period. An analysis of variance test (ANOVA) confirmed a significant difference in mechanical watch mentions across the three

time periods [$F(2, 697) = 33.76$, $p<0.001$]; post hoc analyses using the Tukey HSD test indicated that the means were significant among all the pair-wise comparisons. See table 2 for results, thus indicating that each of the three periods was distinctive from the others.

Insert Table 2 Here

During the period dominated by precision craftsmanship (pre-1983), Swiss companies explicitly mentioned mechanical (44%) and quartz (43%) technologies in their ads at roughly comparable levels between 1970 and 1982. The year 1982 represented the peak of the quartz crisis for Swiss watchmakers, suggesting that the Swiss were advertising both types of technologies as they attempted to respond to the threat from Japanese quartz watches. However, in 1984, a year after the launch of Swatch and the beginning of the fashion period, the Swiss almost completely abandoned advertising the mechanical watch; only 8% of all Swiss advertisements in the journal were quoted as mechanical compared to 75% quoted as quartz.

Following this, there seemed to be a re-emergence in ads that explicitly mentioned mechanical technology during the 1990s. The surge paralleled the identity shift toward luxury; by 1996 mechanical watches made up 63% of all watch advertisements and by 2006 this increased to 78%. Conversely, during the luxury period, the appearance of quartz watch ads fell substantially (averaging only 7% between 1990-2008); in 2006 and 2008 I did not identify a single Swiss watch advertised as quartz. For a depiction of these trends, see Figure 3.

Insert Figure 3 Here

Organizational Identity (H2)

I found support for hypothesis 2, proposing that historical organizational identity reclamation is associated with the re-emergence of market demand for a legacy technology. Analysis of variance tests were significant [$F(2, 697) = 17.82$, $p<0.001$]. Post hoc analyses showed significant differences between time periods 1 and 3 and 2 and 3, highlighting the role of heritage as an identity attribute claimed by organizations during the re-emergence of the mechanical watch, but not important during the earlier fashion period. These findings allude to the salience of company heritage in re-claiming organizational identity during re-emergence.

Legacy organizational identity claims were rare during the precision craftsmanship period, averaging 5% pre-1983. Between 1974 and 1978, not a single ad mentioned company founding, suggesting that companies had little interest in making claims to their past identity or historical heritage while quartz technology was on the rise. During the fashion period, mentions of founding dates fluctuated between 6% (1982), 29% (1986), and 15% (1988), hinting at the uncertainty that watch companies confronted in claiming their identity and a potential return to their historical roots during technological upheaval. In the luxury period, Swiss companies mentioned their heritage more often; over one-fourth of all ads (28%) mentioned company founding in the ads across the period. See Figure 4 for a graphical depiction of these trends.

Insert Figure 4 Here

Community Identity (H3)

Hypothesis 3, positing that changes in community identity that reshape systems of meaning are associated with the re-emergence of market demand for a legacy technology, was also supported. Analysis of variance tests were significant [$F(2, 697) = 16.50$, $p<0.001$]. Post hoc analyses showed significant differences between time periods 1 and 3 and 2 and 3, signifying

that Swiss national and community identity played an important role in redefining the mechanical watch during the luxury period.

Identity claims for "Swissness" during the initial precision craftsmanship period (pre-1983) fluctuated significantly: in 1974, only 18% mentioned any connection to Switzerland, but by 1982, 40% made mention. The Swiss were at their most vulnerable in the mid-1970s, prior to the introduction of Swatch, with its shift toward fashion. During the fashion period, "Swissness" claims oscillated between 10% and 37%, possibly suggesting that mechanical watchmakers struggled to determine whether they should associate with a Swiss identity. However, starting in 1990, as the field shifted toward luxury, identity claims for Swiss climbed year-by-year, reaching a peak of 52% in 2006 and averaging 48% over the period.

These findings suggest that the watchmaking community in Switzerland only made claims for "Swissness" when they were able to align themselves with the broader field level identity. For example, when quartz technology was at its peak during the fashion period, the watchmaking community de-coupled product and community claims to a Swiss identity. However, as the field shifted toward luxury, watchmakers re-coupled their community identity with "Swissness" identity claims. Figure 5 depicts these shifts over time.

Insert Figure 5 Here

Mechanisms of Field Identity Change (H4a-c)

Overall, I found evidence that changes in product, organizational, and community identities were associated with the re-emergence of a legacy technology in Swiss watchmaking, as predicted in hypotheses 1, 2, and 3. Next, I tried to uncover the specific mechanisms by

which such changes occurred, as proposed in hypotheses 4a (temporal references), 4b (linguistic frames and metaphors), and 4c (symbolic value claims).

Temporal Framing: Bridging the Past and Future (H4a). I found support for hypothesis 4a, predicting that the re-emergence of market demand for a legacy technology involves using temporal frames to anchor the past and future; [$F(2, 697) = 15.67$, $p<0.001$]. Post hoc analyses showed significant differences between time periods 1 and 3 and 2 and 3, highlighting the salience of temporal framing in period 3 (luxury) during the re-emergence of the mechanical watch.

The watch ads made scant reference to bridging the past with the future in the period prior to 1983 (9%); in 1976, at the peak of the quartz crisis, not a single ad made a temporal reference to the past. Such few mentions suggest that the ads mirrored industry concerns regarding the future of mechanical watch technology (e.g., Landes, 1983). During the fashion period, mechanical watch ads increased in their temporal bridging, fluctuating between 8% and 26%; this highlighted the extent to which watch companies felt continued uncertainty about the viability of the mechanical watch market. However, as the luxury period emerged, companies increased their bridging references, averaging almost one-third of all ads (31%) and even escalating to 42% in 1996. My findings suggest that as the mechanical watch re-emerged within the context of a new field identity; the industry was able to reclaim its past and more clearly articulate how it bridged to the future. See figure 6 for a diagram of these patterns.

Insert Figure 6 Here

Linguistic Framing: Metaphors & Labels (H4b). My findings suggest that the use of metaphors was an important mechanism for field level identity change, allowing the mechanical

watch's identity to be re-shaped within the context of the broader identity change of the field. I find support for hypothesis 4b, that product, organizational, and community identity change involves using metaphors to create desired meanings. Analysis of variance tests were significant [$F(2, 697) = 15.56$, $p<0.001$]. Post hoc analyses showed significant differences between time periods 1 and 2 and 1 and 3, highlighting the importance of metaphors during the initial introduction of quartz technology in period 1, and again during the re-introduction of the mechanical watch during the luxury period.

During the precision period (pre-1983), the use of metaphors in Swiss watch ads averaged 24%. Mechanical (29%) and quartz (20%) watch ads used metaphors to nearly the same extent in 1976, suggesting that both technologies were attempting to re-define the category. During the fashion period, metaphor use averaged 49%. However, by 1980, mechanical watch manufacturers made no use of metaphors, harkening to Powell and Colyvas' (2008: 294) "reefs of dead metaphors" that result when metaphors no longer help actors interpret that which was "novel."

Finally, when the field identity shifted towards luxury, there was a re-emergence of metaphors (50%, 1990-2008). Metaphors were especially associated with mechanical watches; between 1996 and 2000, no less than 57%, of all the mechanical watch ads used metaphors, suggesting the potency of this linguistic mechanism in facilitating the mechanical watch's re-emergence. For example, Frank Muller, a Geneva company, released series of ads in the 1990s with the slogan "Master of Complications," making reference to their sophisticated mechanical watch functions while also alluding to the type of person who might purchase their watch.

Conversely, the use of metaphors for quartz watch ads was high in 1984 (75%) after the release of Swatch and the beginning of the fashion period. However, as the field moved toward

luxury, the use of metaphors associated with Swiss quartz ads fluctuated a great deal; in 1994 no quartz ads used metaphors, but 75% used them in 1996. These fluctuations allude to the challenges faced by Swiss companies who decided to continue to produce quartz watches in the 1990s while the mechanical watch was re-emerging. See Figure 7.

Insert Figure 7 Here

Symbolic Value Framing: Use of Value Claims (H4c). I found support for hypothesis 4c, that mechanisms of symbolic value framing are associated with the re-emergence of market demand for a legacy technology. Analysis of variance tests showed significant differences between the periods for claims of status [$F(2, 697) = 43.51$, $p<0.001$] and fashion [$F(2, 697) = 12.65$, $p<0.001$]. Post hoc analysis for status found differences between periods 1 and 3 and 2 and 3; and fashionable claims experienced differences between periods 1 and 2 and 2 and 3. These differences validate that fashionable value claims were indeed important during period 2 (fashion), and similarly, that status or elite value claims were salient during period 3 (luxury).

In the precision craftsmanship period (pre-1983), I found value claims related to the utility and functionality of the watch averaged 71%; conversely, claims for status or exclusivity, as well as fashion, averaged 18%. These findings suggest that during this initial period, Swiss firms continued to rely on a centuries-old assumption that precision and functionality were the qualities that made watches superior and appealing. During the fashion period, however, average claims for utility dropped to 59%, but claims associating watches with both fashion and status climbed to 49% and 29%, respectively. The significant increase in fashion value claims during this period was likely influenced by the launch of Swatch, whose ads encouraged customers to treat their colorful watches as fashion accessories. Finally, during the luxury period, fashion

claims subsided to only 24%; alternatively, 57% of all ads made claims for status or exclusivity. Interestingly, utility claims continued to remain salient during this period, averaging 64% of all the ads during the period. Such findings suggest that the mechanical watch producers relied on both status and utility as value claims in the luxury period.

Notably, I did not find significant differences across the periods for value claims related to utility and functionality. Swiss watchmakers may have been unwilling to completely relinquish the functionality claims that had made them so successful in the past, but rather, complemented utility with status. These dual value claims appear to have allowed the Swiss to redefine their competitive set (Porac et al., 1989) within the high-end luxury segment. Unlike the quartz revolution of the 1970s and early 1980s, Swiss watchmakers in the 1990s and 2000s appeared more comfortable making claims for utility once they were not competing against (more precise and cheaper) quartz watches. See Figure 8.

Insert Figure 8 Here

To summarize, I found support for Hypotheses 1, 2, 3; changes in product, organizational, and community identities are associated with the re-emergence of market demand for a legacy technology. In addition, temporal framing, linguistic framing, and symbolic value framing all served as significant mechanisms of identity change. Interestingly, my post hoc analyses revealed that not all the mechanisms or elements of identity were consistently salient within the field of Swiss watchmaking across all the time periods between 1970 and 2008. This is a topic I discuss more fully in the following section.

DISCUSSION

I began my inquiry with a question: Can market demand for "dying" technologies in a mature field re-emerge and re-shape it? I sought answers in my study of Swiss watchmaking, during the period 1970-2008, in an historical analysis of the field and the ways in which product, organizational, and community identity shifted with the introduction of a discontinuous technology (quartz watches) and the reclamation of a legacy technology (mechanical watches). Using content analysis of watch advertisements appearing in leading industry journals and interview data, I found evidence not only for the decline of legacy identities (i.e., Swiss mechanical watches) but also their subsequent re-emergence. I unearth several mechanisms that potentially facilitated these changes in the field: temporal bridging, from a past legacy to a desired future; linguistic framing, particularly with metaphors; and symbolic framing, with respect to value claims. This evidence suggests an intriguing counter-intuitive: although new or discontinuous technologies tend to displace older ones (e.g., Anderson & Tushman, 1990), these legacy technologies can re-emerge, co-exist with, and even come to dominate newer technologies. Core to this process seems to be the creation – and re-creation – of product, organization, and community identities that resonate with the re-emergence of markets for legacy technologies.

I summarize my key findings in a conceptual framework (Figure 9) depicting the relationships between product identity, organizational identity, and community identity. The framework focuses on the interaction of each component during periods of field change and re-emergence. My findings suggest that technology re-emergence is related to processes of identity "coupling" and "de-coupling." These processes highlight the interplay among *community, organization,* and *product* identities and suggest that substantial economic change may not be

contained only within organizational or industry boundaries (Davis & Marquis, 2005), but extend outward to include broader forces related to field level change. Below, I discuss how processes of identity coupling and de-coupling are salient to technological re-emergence.

Insert Figure 9 Here

Defining *community identity* as the shared sense of "we-ness" (Snow, 2001) among Swiss watchmakers, *organizational identity* as that which is core, distinctive and enduring about a company (Albert & Whetten, 1985), and *product identity* as the key attributes, design, and architecture (Ulrich, 1995) of the watch, I revealed that all three components were important to the field level identity change, but their inter-relationships differed in accord with field shifts – coupling, de-coupling, and then re-coupling over time.

In the case of watchmaking, before the rise of quartz technology, the dominant design of the watch was based on precision and the creation of highly intricate mechanical products. These design attributes were particularly well-suited for the snow-locked Jura farmers who could build watches in the winters without the need to import considerable raw materials from outside the region. They excelled at this and by the early 19th century, particularly within the Jura community, began to identify with the highly complicated watches they made, rather than the farms they maintained during the summer. Over time, the Jura community's connection to the mechanical watch led them to develop some of the first standardized tests for accuracy, global competitions, regulations, and schools devoted to watch innovation.

By the early 20th century, the region's success in the mechanical watch industry led the Jura to label itself "the land of precision." Annual competitions allowed companies to claim they were distinct and produced uniquely superior watches; yet, for many decades following World

War I, the Swiss government imposed a highly effective cartel system that demanded close familial-like relationships and cooperative research programs between all organizations involved in watchmaking (Uttinger & Papera, 1965). As one social scientist noted, "More important to the development of Swiss skill levels was the cultural organization of the Jura region" (Glasmeier, 2000: 99). During this period, the product identity (of the mechanical watch), the organizational identity (of the firms), and the community identity (of the Jura region watchmakers) were tightly *coupled*.

However, as the field of Swiss watchmaking moved away from precision craftsmanship and toward fashion, product, organizational, and community identity decoupled. Many credit SMH CEO, Nicolas Hayek, whose vision restructured (and possibly saved) the entire Swiss watchmaking industry (Glasmeier, 2000; Moon, 2004; Taylor, 1993). Under his leadership, novel products like Swatch were launched during this period. An early Swatch ad boasted:

> Swatch. On one hand it's very Swiss, Water-resistant, shock-resistant. With precise Swiss quartz technology. On the other hand, it rocks the boat. With outrageous colors, up-to-the minute styles, and prices under $35. So why not get two or three? [Company archival document, 1983]

The advertisement offers a clear contrast to the tightly coupled identities that linked the master craftsmen and mechanical watches a decade before. The Swiss watchmaking industry, when faced with adapting to a new dominant design, was forced to *de-couple* product identity (low cost, few parts, quartz), their organizational identity (anchored in a historical tradition of mechanical watchmaking) and community identity ("land of precision").

Finally, as the field moved toward a focus on luxury, a re-coupling of product, organizational, and community identity occurred that allowed the master craftsmen to continue to build their works of art. One industry expert (Pasquier, 2008: 314) noted how the shift facilitated a re-coupling of "who we are" and "what we do":

> Companies began making mechanical watches that they instilled with a large dose of emotion as compared to the quartz models, considered merely functional. Mechanical timekeepers became objects of luxury consumption and social distinction. In producing mechanical watches, watchmaking companies cast themselves in the role of guarantors of a centuries-old regional tradition. Several industrial groups active in the luxury sector (LVMH, Richemont, Bulgari) were sensitive to this factor.

With this study, I contribute to theory in several ways. First, I explore the relationship among field dynamics, identities, and technological change. By treating fields and identity as dynamic and mutable, I was able to explore their association with technology cycles that affected products, organizations, and communities. Although I identified technological change as an impetus for field change, in reality, the relationship is likely more contemporaneous than causal; after all, the Swiss were the first to develop the quartz movement. However, its disruptive potential to the extant identity coupling between product, organization, and community tended to dampen the Swiss enthusiasm for developing it further. Thus, it was not technology per se that precipitated field change, but rather, what Orlikowski (2000: 407) termed "technologies-in-practice," i.e., "the sets of rules and resources that are (re)constituted in people's recurrent engagement with the technologies at hand" which function as a ''behavioral and interpretive template'' (Barley, 1988: 49). Such a view suggests the viability of using a practice lens with which to view technology, as well as fields.

Second, I extend the theorization of identity to products, organizations, and communities and embed these within technological cycles of change. I have already observed the tight identity coupling and subsequent re-coupling – between product (mechanical watch), organization (firms), and community (Swiss watchmakers) – in watchmaking. I can speculate that the potency of this link may have been reinforced by a number of factors external to the industry. In this case, for instance, "community" connoted both the historical heritage associated with skilled industry producers (Jura-based farmers and Geneva-based jewelers) and the

geographic region in which they lived and worked; as such, they were simultaneously embedded in geographic and industry communities which tended to reinforce each other (Marquis & Battilana, 2009) and encourage the kind of institutional entrepreneurship (Battilana et al., 2009) that could redirect the field of watchmaking. Thus, "who we are" (as a community) and "what we do" (as watch producers) were mutually constitutive for Swiss watchmakers and may have been a potent force that sought re-coupling in the face of the de-coupling precipitated by technological change.

Finally, I offer an important empirical setting to revisit assumptions about Schumpeter's notion of Creative Destruction and technology cycles. Certainly, technological shifts can create waves of creative destruction, but these are likely bound in time and place and better seen as provisional rather than permanent; in Swiss watchmaking, I saw how market demand for legacy technologies can re-emerge and allow them to thrive. Thus, treating field level change as tentative and time-bound may allow deeper insights into the mechanisms that propel emergence, and even re-emergence.

REFERENCES

Abernathy, W. 1976. The Productivity Dilemma; Roadblock to Innovation in the Automobile Industry.

Adner, R., & Snow, D. 2010. Old technology responses to new technology threats: demand heterogeneity and technology retreats. ***Industrial & Corporate Change***, 19(5): 1655-1675.

Albert, S., & Whetten, D. A. 1985. Organizational Identity. ***Research in Organizational Behavior***, 7: 263-295.

Anderson, P., & Tushman, M. 1990. Technological Discontinuities and Dominant Designs: A Cyclical Model of Technological Change. ***Administrative Science Quarterly***, 35(4).

Ansari, S., & Garud, R. 2009. Inter-generational transitions in socio-technical systems: The case of mobile communications. ***Research Policy***, 38(2): 382-392.

Barley, S. 1988. Technology, power, and the social organizational of work: Towards a pragmatic theory of skilling and deskilling. ***Research in the Sociology of Organizations***, 6: 33-80.

Barley, S. R. 1986. Technology as an Occasion for Structuring: Evidence from Observations of CT Scanners and the Social Order of Radiology Departments. ***Administrative Science Quarterly***, 31(1): 78-108.

Baron, J., Dobbin, F., & Jennings, P. 1986. War and peace: The evolution of modern personnel administration in US industry. ***American Journal of Sociology***: 350-383.

Battilana, J., Leca, B., & Boxenbaum, E. 2009. How Actors Change Institutions: Towards a Theory of Institutional Entrepreneurship. ***Academy of Management Annals***, 3(1): 65-107.

Bayazit, N. 2004. Investigating design: A review of forty years of design research. ***Design Issues***, 20(1): 16-29.

Benner, M. 2010. Securities analysts and incumbent response to radical technological change: Evidence from digital photography and internet telephony. ***Organization Science***, 21(1): 42-62.

Berger, P., & Luckmann, T. 1967. The Social Construction of Knowledge–A Treatise in the Sociology of Knowledge. ***London: Allen Lane***.

Cameron, K. S. 1986. Effectiveness As Paradox: Consensus and Conflict in Conceptions of Organizational Effectiveness. ***Management science***, 32(5): 539-553.

Clark, K. 1985. The interaction of design hierarchies and market concepts in technological evolution. ***Research Policy***, 14(5): 235-251.

Corley, K. G., Harquail, C. V., Pratt, M. G., Glynn, M. A., Fiol, C. M., & Hatch, M. J. 2006. Guiding Organizational Identity Through Aged Adolescence. ***Journal of Management Inquiry***, 15(2): 85-99.

Cornelissen, J. P., Haslam, S. A., & Balmer, J. M. T. 2007. Social Identity, Organizational Identity and Corporate Identity: Towards an Integrated Understanding of Processes, Patternings and Products. ***British Journal of Management***, 18: 1-16.

Creswell, J. 2003. ***"Mixed methods procedures." Research Design: Qualiative, quantitative, and mixed methods approaches***. Thousand Oaks: Sage.

Davis, G. F., & Marquis, C. 2005. Prospects for Organization Theory in the Early Twenty-First Century: Institutional Fields and Mechanisms. ***Organization Science***, 16(4): 332-343.

Deephouse, D. L. 1999. To Be Different, or to Be the Same? It's a Question (And Theory) of Strategic Balance. ***Strategic Management Journal***, 20(2): 147-166.

Dittmar, H. 1992. ***The Social Psychology of Material Possessions: To Have Is To Be***. New York: St Martin's Press.
Donze, P. 2011. ***History of the Swiss Watch Industry: From Jacques David to Nicolas Hayek***. Bern, Switzerland: Peter Lang AG.
Drazin, R., Glynn, M., & Kazanjian, R. 1999. Multilevel theorizing about creativity in organizations: A sensemaking perspective. ***Academy of Management Review***: 286-307.
Dutton, J. E., & Dukerich, J. M. 1991. Keeping an Eye on the Mirror: Image and Identity in Organizational Adaptation. ***Academy of Management Journal***, 34(3): 517-554.
Federation of the Swiss Watch Industry. 2009. Annual Report: 2008.
Fiol, C. 1991. Managing culture as a competitive resource: An identity-based view of sustainable competitive advantage. ***Journal of Management***, 17(1): 191.
Fiol, C. M. 2002. Capitalizing on Paradox: The Role of Language in Transforming Organizational Identities. ***Organization Science***, 13(6): 653-666.
Fiss, P. C., & Zajac, E. J. 2006. The Symbolic Management of Strategic Change: Sensegiving via Framing and Decoupling. ***The Academy of Management Journal***, 49(6): 1173-1193.
Fleming, L. 2001. Recombinant Uncertainty in Technological Search. ***Management science***, 47(1): 117-132.
Fligstein, N. 1990. ***The Transformation of corporate control***. Cambridge: Harvard University Press.
Foster, R. N. 1986. ***Innovation: The attacker's advantage***. New York: Summit Books.
Gioia, D. A. 1998. From individual to organizational identity. . In D. A. Whetten, & P. C. Godfrey (Eds.), ***Identity in organizations: Building theory through conversations***: 17–31. Thousand Oaks, CA: Sage.
Gioia, D. A., Schultz, M., & Corley, K. G. 2000. Organizational Identity, Image, and Adaptive Instability. ***Academy of Management Review***, 25(1): 63-81.
Glasmeier, A. 1991. Technological discontinuities and flexible production networks: The case of Switzerland and the world watch industry. ***Research Policy***, 20(5): 469-485.
Glasmeier, A. 2000. ***Manufacturing time: global competition in the watch industry, 1795-2000***: The Guilford Press.
Glynn, M. A. 2000. When Cymbals Become Symbols: Conflict Over Organizational Identity Within a Symphony Orchestra. ***Organization Science***, 11(3): 285-298.
Glynn, M. A. 2008. Beyond Constraint: How Institutions Enable Identities. In R. Greenwood, C. Oliver, K. Sahlin, & R. Suddaby (Eds.), ***SAGE Handbook of Organizational Institutionalism***. Thousand Oaks, CA: SAGE Publications.
Glynn, M. A., & Abzug, R. 2002. Institutionalizing Identity: Symbolic Isomorphism And Organizational Names. ***Academy of Management Journal***, 45(1): 267-280.
Goffman, E. 1974. ***Frame Analysis***. Cambridge: Harvard University Press
Greenwood, R., & Hinings, C. 1988. Organizational design types, tracks and the dynamics of strategic change. ***Organization studies***, 9(3): 293.
Hargadon, A., & Douglas, Y. 2001. When innovations meet institutions: Edison and the design of the electric light. ***Administrative Science Quarterly***: 476-501.
Harley, C. K. 1971. The shift from sailing ships to steamships, 1850-1890: A study in technological change and its diffusion. In D. N. McCloskey (Ed.), ***Essays on a mature economy: Britain after 1840***, 439 ed. Princeton: NJ: Princeton University Press.
Henderson, R. 1995. Of life cycles real and imaginary: The unexpectedly long old age of optical lithography. ***Research Policy***, 24(4): 631-643.

Kaplan, S. 2008. Cognition, capabilities, and incentives: Assessing firm response to the fiber-optic revolution. ***Academy of Management Journal***, 51(4): 672-695.
Kaplan, S., & Tripsas, M. 2008. Thinking about technology: Applying a cognitive lens to technical change. ***Research Policy***, 37(5): 790-805.
Kennedy, M. T. 2008. Getting Counted: Markets, Media, and Reality. ***American sociological review***, 73(2): 270-295.
Klepper, S. 1996. Entry, Exit, Growth, and Innovation over the Product Life Cycle. ***The American Economic Review***, 86(3): 562-583.
Lampel, J., & Meyer, A. 2008. Field-configuring events as structuring mechanisms: how conferences, ceremonies, and trade shows constitute new technologies, industries, and markets. ***Journal of Management Studies***, 45(6): 1025-1035.
Landes, D. 1983. ***Revolution in time: clocks and the making of the modern world***. Cambridge: Harvard University Press.
Lecoq, B., Maillat, D., Nemeti, F., & Pfister, M. 1995. Technology district and innovation: the case of the Swiss Jura Arc. ***Regional Studies***, 29(3): 251+.
Marquis, C., & Battilana, J. (Eds.). 2009. ***Acting globally but thinking locally? The enduring influence of local communities on organizations***. (Vol. 29).
Marquis, C., Glynn, M. A., & Davis, G. F. 2007. Community Isomorphism and Corporate Social Action. ***Academy of Management Review***, 32(3): 925-945.
Mehra, A., Kilduff, M., & Brass, D. J. 1998. At the Margins: A Distinctiveness Approach to the Social Identity and Social Networks of Underrepresented Groups. ***The Academy of Management Journal***, 41(4): 441-452.
Mervis, C., & Rosch, E. 1981. Categorization of natural objects. ***Annual Review of Psychology***, 32(1): 89-115.
Meyer, J. P., Bartunek, J. M., & Lacey, C. A. 2002. Identity Change and Stability in Organizational Groups: A Longitudinal Investigation. ***International Journal of Organizational Analysis (1993 - 2002)***, 10(1): 4.
Moon, Y. 2004. The birth of Swatch. ***Harvard Business School Publications, Boston, EUA***: 1-15.
Navis, C., & Glynn, M. A. 2010. How New Market Categories Emerge: Temporal Dynamics of Legitimacy, Identity, and Entrepreneurship in Satellite Radio, 1990-2005. ***Administrative Science Quarterly***, 55(3): 439-471.
Navis, C., & Glynn, M. A. 2011. Legitimate Distinctiveness and the Entrepreneurial Identity: Influence on Investor Judgments of New Venture Plausibility. ***Academy of Management Review***, 36(3).
Orlikowski, W. 2000. Using technology and constituting structures: A practice lens for studying technology in organizations. ***Organization Science***, 11: 404-428.
Pasquier, H. 2008. Remodlelled industry. In J. Bujard, & L. Tissot (Eds.), ***The territory of Neuchatel and its horological heritage***: Editions de la Chatiere.
Perret, T. 2008. A canton under the influence. In J. Bujard, & L. Tissot (Eds.), ***The territory of Neuchatel and its horological heritage***: Editions de la Chatiere.
Porac, J., Thomas, H., & Baden Fuller, C. 1989. Competitive groups as cognitive communities: The case of Scottish knitwear manufacturers. ***Journal of Management Studies***, 26(4): 397-416.

Powell, W., & Colyvas, J. 2008. Microfoundations of institutional theory. In R. Greenwood, C. Oliver, K. Sahlin, & R. Suddaby (Eds.), ***The Sage Handbook of Organizational Institutionalism***: 276-298. London: Sage.

Pratt, M. G., & Foreman, P. O. 2000. Classifying Managerial Responses to Multiple Organizational Identities. ***Academy of Management Review***, 25(1): 18-42.

Pratt, M. G., & Rafaeli, A. 1997. Organizational Dress as a Symbol of Multilayered Social Indentities. ***Academy of Management Journal***, 40(4): 862-898.

Ravasi, D., & Canato, A. 2010. We are what we do (and how we do it): Organisational technologies and the construction of organisational identity, ***Technology and Organization: Essays in Honour of Joan Woodward. (Research in the Sociology of Organizations)***, Vol. 29: 49-79. London: Emerald Group Publishing Limited.

Ravasi, D., & Schultz, M. 2006. Responding to Organizational Identity Threats: Exploring the Role of Organizational Culture. ***Academy of Management Journal***, 49(3): 433-458.

Ravasi, D., & Stigliani, I. 2012. Product Design: a Review and Research Agenda for Management Studies. ***International Journal of Management Reviews***.

Reardon, J. 2008. ***Patek Phiippe in America: Marketing the world's foremost watch***: Cefari.

Rogers, E. 1995. ***Diffusion of innovations***: Free press.

Rosa, J. A., Porac, J. F., Runser-Spanjol, J., & Saxon, M. S. 1999. Sociocognitive dynamics in a product market. ***The Journal of Marketing***, 63: 64-77.

Schultz, M., & Hernes, T. 2012. A Temporal Perspective on Organizational Identity. ***Organization Science***.

Schumpeter, J. 1942. ***Capitalism, socialism and democracy***: Routledge.

Scott, W. 2008. ***Institutions and organizations: Ideas and interests***: Sage Publications, Inc.

Scott, W. R. 1987. The adolescence of institutional theory. ***Administrative Science Quarterly***, 32(4): 493-511.

Scott, W. R. 1994. Conceptualizing organizational fields: Toward a theoretical synthesis. In H. Derlien, U. Gerhardt, & F. W. Scharpf (Eds.), ***Systems Rationality and Partial Interests***: 203-221. Baden-Baden, Germany: Nomos Verlagsgesellschaft.

Snow, D. 2001. Collective identity and expressive forms: Center for the Study of Democracy, University of California Irvine.

Snow, D. 2008. Extraordinary efficiency growth in response to new technology entry: the carburetor's "Last Gasp". ***Harvard Business School Working Paper #1668643***.

Sobel, D. 1996. ***Longitude: The true story of a lone genius who solved the greatest scientific problem of his time***: Fourth Estate London.

Taylor, W. 1993. Message and muscle: an interview with Swatch titan Nicolas Hayek. ***Harvard business review***, 71: 98-98.

Tripsas, M. 2009. Technology, Identity, and Inertia Through the Lens of The Digital Photography Company. ***Organization Science***, 20(2): 441-460.

Tripsas, M., & Gavetti, G. 2000. Capabilities, cognition, and inertia: Evidence from digital imaging. ***Strategic Management Journal***, 21(10-11): 1147-1161.

Trueb, L. 2005. ***The World of Watches: History, Technology, Industry***. New York: Ebner.

Tushman, M., & Anderson, P. 1986. Technological discontinuities and organizational environments. ***Administrative Science Quarterly***, 31(3): 439-465.

Tushman, M., & Anderson, P. 1997. ***Managing strategic innovation and change***: Oxford University Press New York.

Tushman, M., & Murmann, J. 2002. Dominant designs, technology cycles, and organizational outcomes. ***Managing in the Modular Age: Architectures, Networks, and Organizations***.

Tushman, M., & Radov, D. 2000. Case: Rebirth of the Swiss Watch Industry, 1980-1992 (A). ***Harvard Business School Publications***, 400-087.

Tushman, M. L., & Rosenkopf, L. 1992. Organizational determinants of technological change: toward a sociology of technological evolution. ***Research in organizational behavior***, 14: 311-347.

Ulrich, K. 1995. The role of product architecture in the manufacturing firm. ***Research Policy***, 24(3): 419-440.

Utterback, J. M., Vedin, B. A., Alvarez, E., Ekman, S., Sanderson, S. W., Tether, B., & Verganti, R. 2010. ***Design-inspired innovation***. Hackensack, NJ: World Scientiific Publishing.

Uttinger, H. W., & Papera, D. R. 1965. Threats to the Swiss Watch Cartel. ***Economic Inquiry***, 3(2): 200-216.

Walsh, I. J., & Glynn, M. A. 2008. The Way We Were: Legacy Organizational Identity and the Role of Leadership. ***Corporate Reputation Review***, 11(3): 262-276.

Weber, K., Heinze, K. L., & DeSoucey, M. 2008. Forage for Thought: Mobilizing Codes in the Movement for Grass-fed Meat and Dairy Products. ***Administrative Science Quarterly***, 53(3): 529-567.

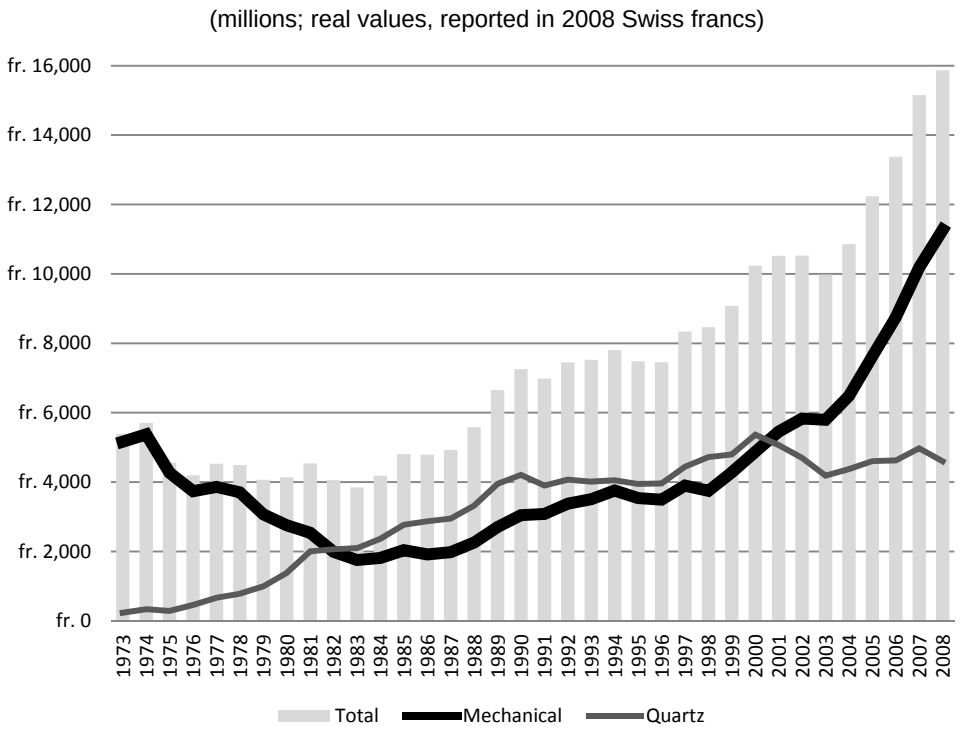
Whetten, D. A., & Mackey, A. 2002. A Social Actor Conception of Organizational Identity and Its Implications for the Study of Organizational Reputation. ***Business & Society***, 41(4): 393-414.

Wry, T., Lounsbury, M., & Glynn, M. A. 2011. Legitimating Nascent Collective Identities: Coordinating Cultural Entrepreneurship. ***Organization Science***, 22(2): 449-463.

Zuckerman, E. 1999. The Categorical Imperative: Securities Analysts and the Illegitimacy Discount. ***American Journal of Sociology***, 104(5): 1398-1397.

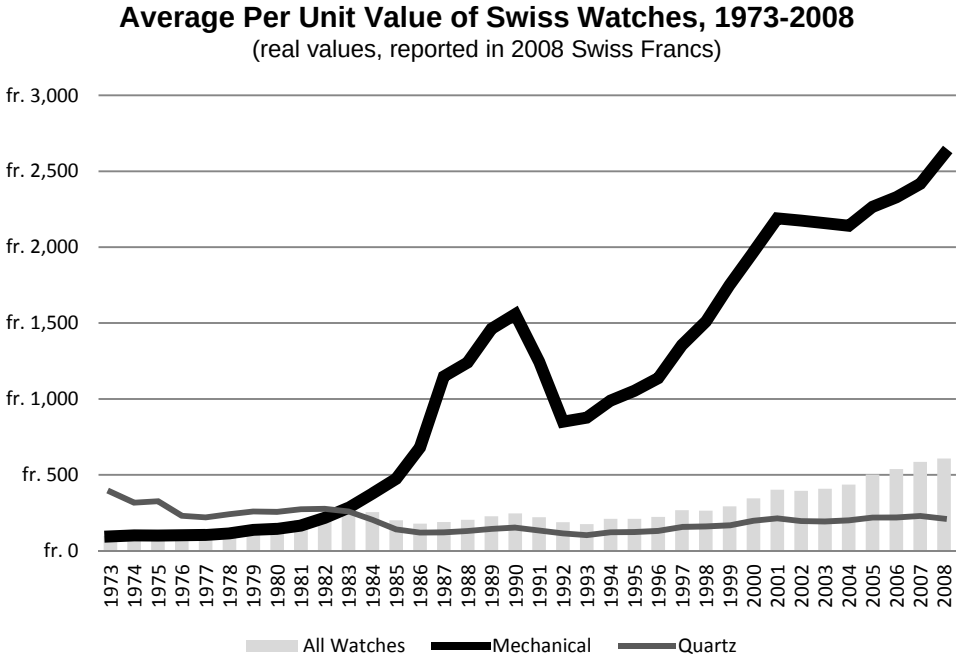
Zuckerman, E. 2000. Focusing the corporate product: securities analysts and de-diversification. ***Administrative Science Quarterly***, 45(3): 591-619.

Figure 1: Export Value of Swiss Watches, 1973-2008



Source: Federation of the Swiss Watch Industry; World Economic Outlook data, IMF; analysis by author.

Figure 2: Average Per Unit Value of Swiss Watches, 1973-2008



Source: Federation of the Swiss Watch Industry; World Economic Outlook data, IMF; analysis by author.

Figure 3: Product Identity- Watch Technology Claims

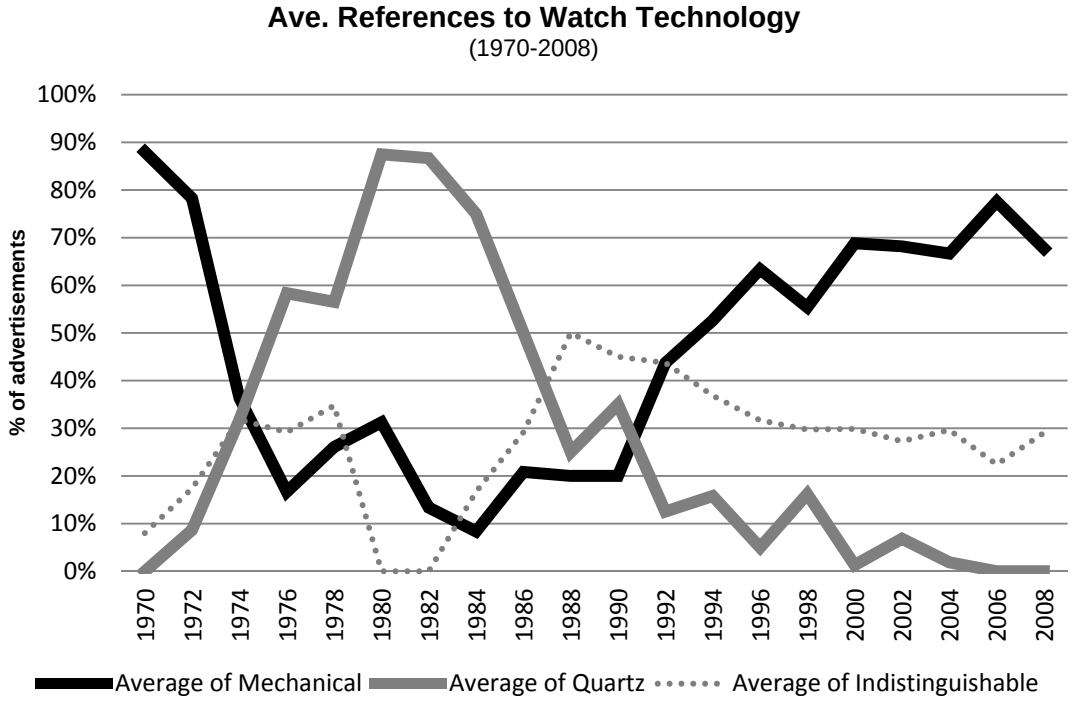


Figure 4: Organizational Identity – Claims of Legacy Heritage

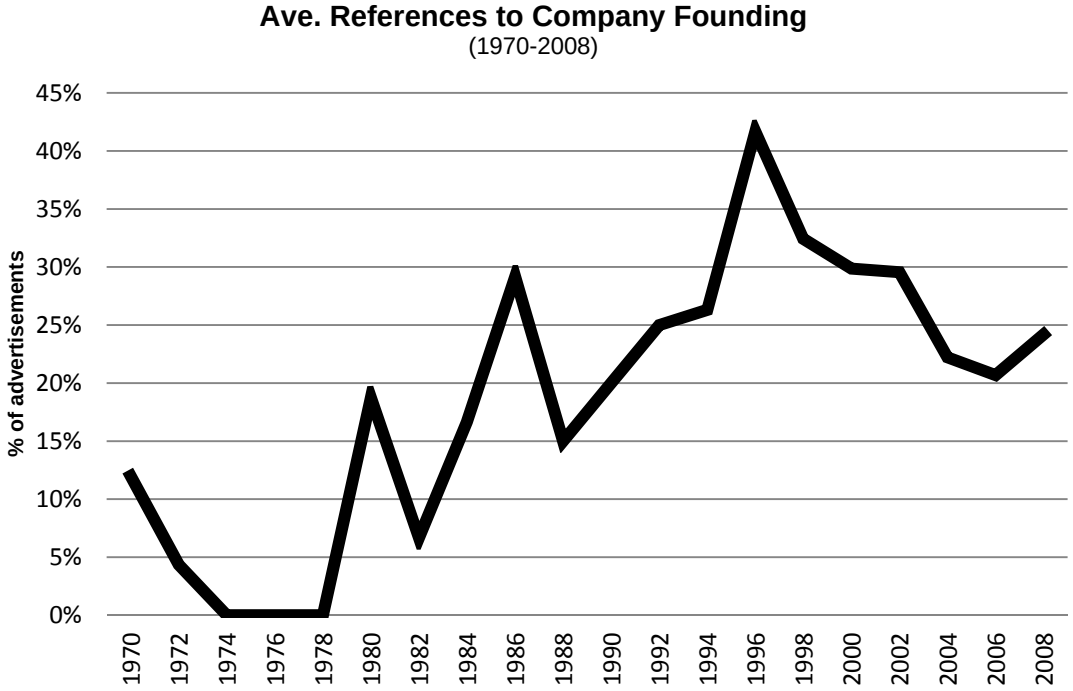


Figure 5: Community Identity – "Swissness" Claims

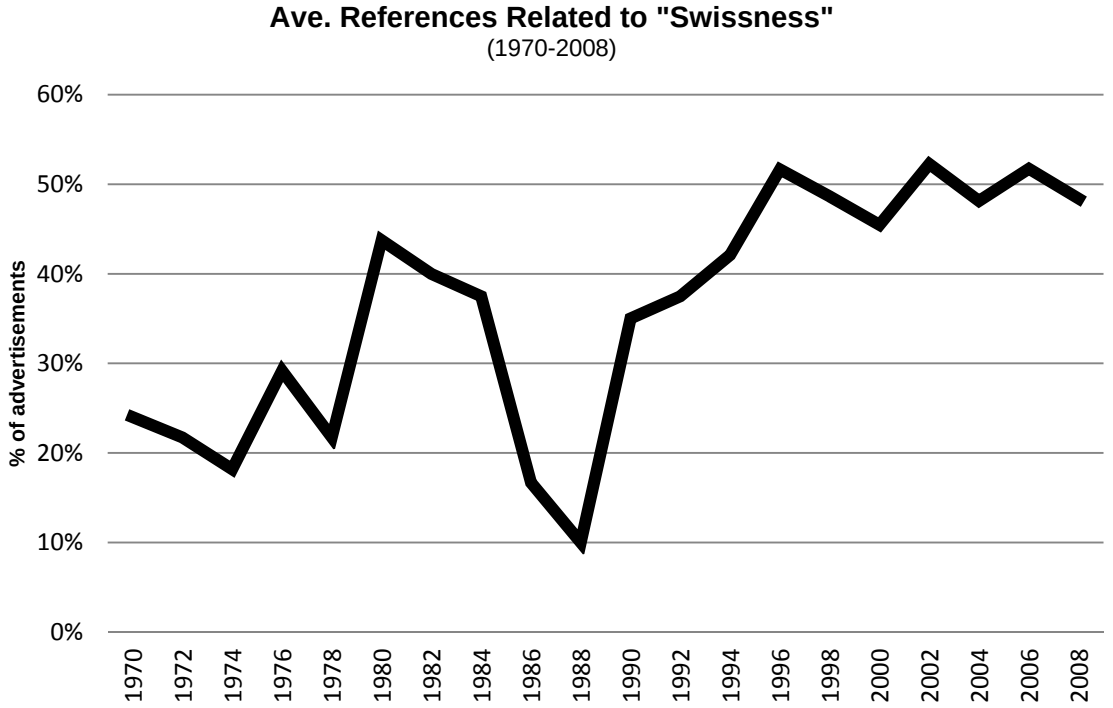


Figure 6: Temporal Framing Mechanisms – References that Bridge Past & Future

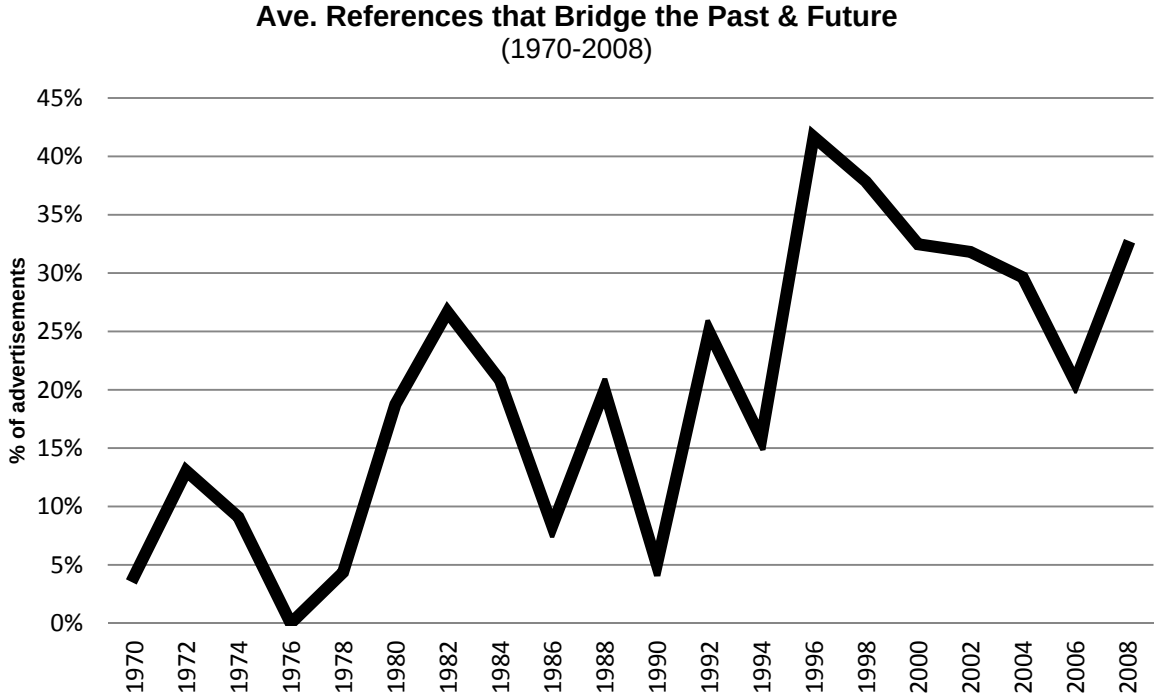


Figure 7: Linguistic Framing Mechanisms – Use of Metaphors

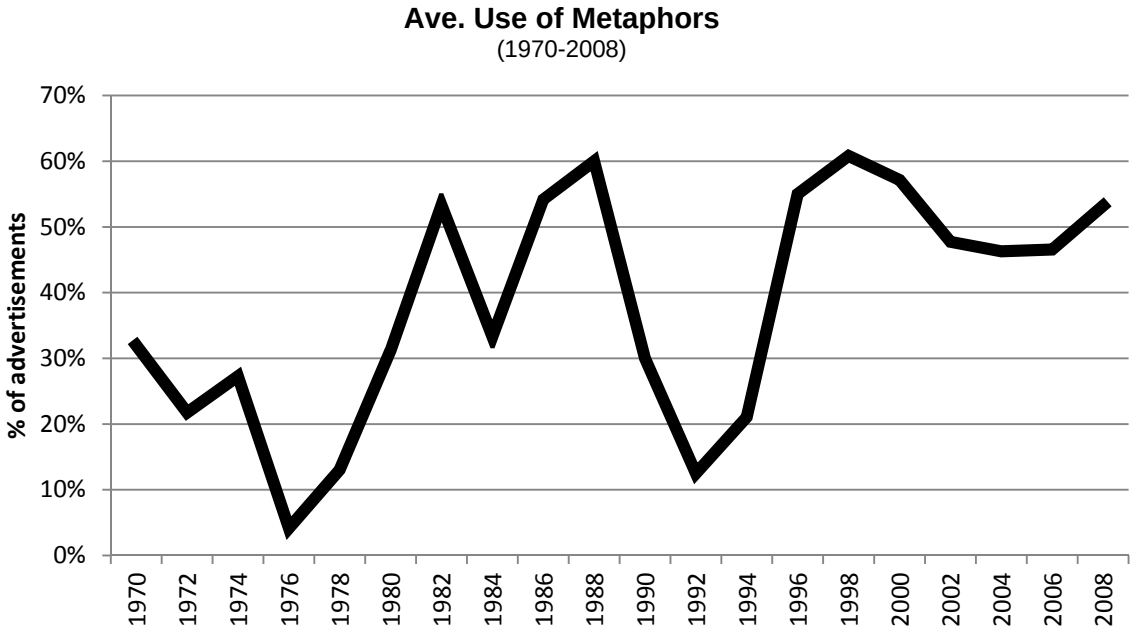


Figure 8: Symbolic Value Framing Mechanisms – Use of Value Claims

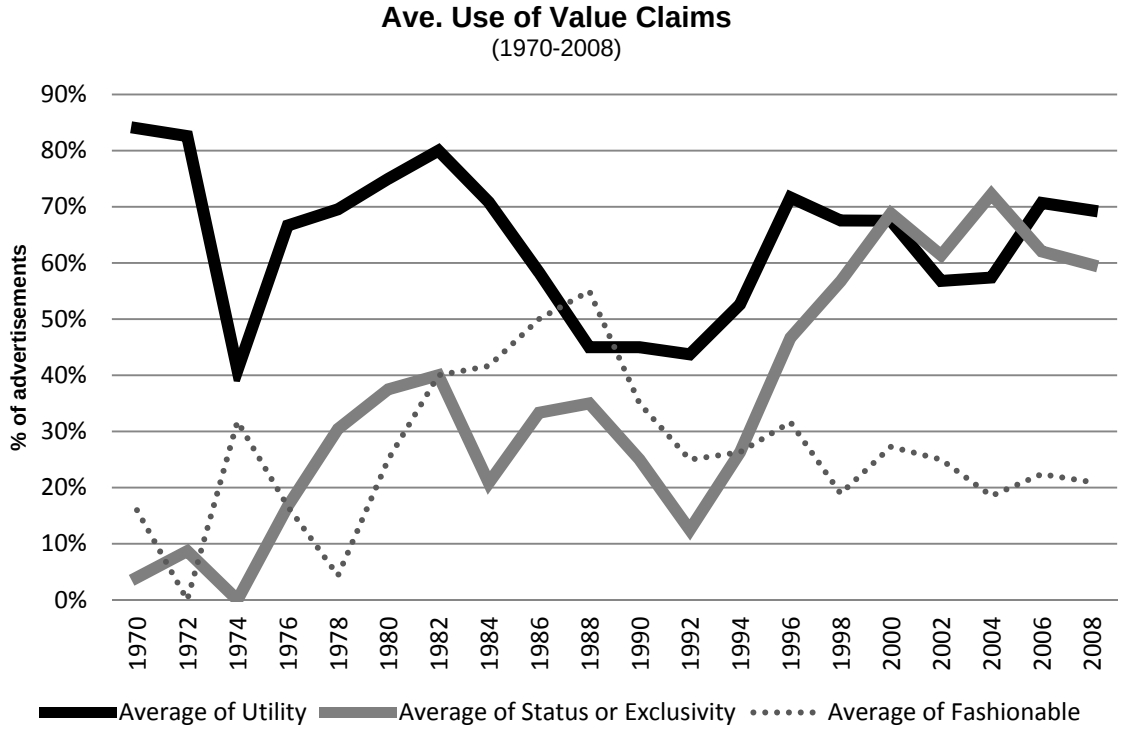


Figure 9: Conceptual Model of Identity Change Associated with the Re-Emergence of a Market for a Legacy Technology in a Mature Field

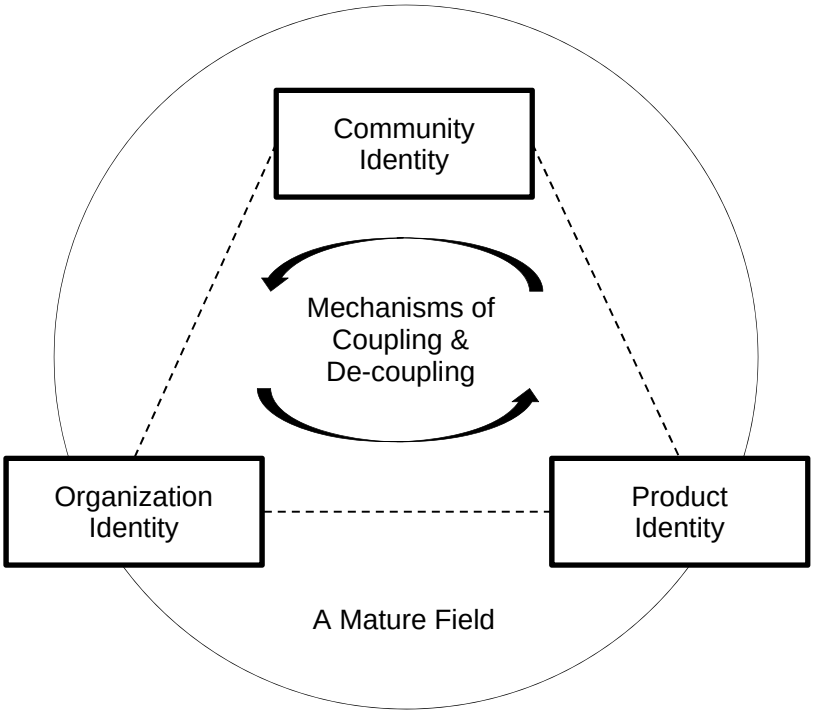


Table 1: Codebook

Article	Code	Description	Examples
Identifier	*ID*	*Individual identifier for each advertisement in the sample.*	*Examples from Advertisements*
Product Identity	Watch Technology	0= Indistinguishable 1= Mechanical 2= Quartz	*Mechanical:* "Kelek and the professionals. Automatic mechanical diving watch intended for professionals." *Quartz:* "The spell of a new concept Hublot, the perfection of Swiss technology with an exclusive natural rubber strap. Quartz movement, waterproof 5 ATM. 18 K gold."
Organizational Identity	Company Heritage	0= no mention of company founding 1= mention of company founding	*Founding Year:* "Perrelett 1777. Inventor of the Automatic Watch."
Community Identity	"Swissness" Identity Claims	0= Does not make explicit reference to Swiss nature of the watch or product. 1= Makes explicit reference to the Swiss brand, either in the text or by prominently displaying "Swiss made" in the ad photo or graphic. May include references to the collective identity of the Swiss watchmaking community, highlighting what makes them distinctive or unique from other global watchmakers.	*Swissness:* "Elegant masterpieces of contemporary art. Designed and hand-crafted to perfection by traditional Swiss goldsmiths and expert Swiss watchmakers."
Mechanisms	Temporal Framing	0= None 1= Attempts to bridge the past (e.g., history, traditions) and the future (e.g., what lies ahead, upcoming, forward thinking).	*Past:* "Timeless fascination. Collection 1856. From the year of its birth, Eterna has followed a simple, unchanging rule: making the finest watches imaginable." *Future:* "This is a movement that helps write today a page of tomorrow's horological history." *Bridges Past & Future:* "The past inspiring the future."
	Linguistic Framing	0= Does not use a metaphor to describe the watch. 1= Uses a metaphor to describe the watch.	*Metaphor:* "Chris Evert-Lloyd and her Lady-Datejust. They may be very, very tough, but both of them are every inch a lady."
	Symbolic Value Framing -utility/function -fashionable -status/eliteness	0= Does not make specific value claim 1= Makes value claim. - Utility: functionality or use value - Fashionable: makes a fashion statement or is associated with a fad. - Status: incorporates an element of 'scarcity' (e.g., high price, entrance into elite social group)	*Utility/Function:* "Ultra-tough. Ultra-Waterproof." *Fashionable:* "Can a Timepiece be a Fashion Piece? Yes" *Status/Eliteness:* "Men who guide the destinies of the world wear Rolex watches."

Table 2: Results of analysis of variance of advertisement features across time periods

H:	Construct		Time Period				F-test	Post Hoc Analyses		
	Advertisement Feature		*T1: Precision Craft'ship (1970-1982) n=148*	*T2: Fashion (1984-1988) n=68*	*T3: Luxury (1990-2008) n=484*	*All Time Periods n=700*		*T1 vs. T2*	*T1 vs. T3*	*T2 vs. T3*
	Product Identity:		*(% of advertisements depicting feature)*							
1	Mechanical	Mean	0.44	0.16	0.63	0.55	33.76***	6.58*	4.58*	11.15*
		S.D	0.50	0.37	0.48	0.50				
	Quartz	Mean	0.43	0.52	0.07	0.19	95.69***	2.91	11.76*	14.67*
		S.D	0.50	0.50	0.25	0.39				
	Organizational Identity:									
2	Year Company Founded	Mean	0.05	0.21	0.28	0.23	17.82***	4.19*	6.31*	2.13
		S.D	0.23	0.41	0.45	0.42				
	Community Identity:									
3	Swissness	Mean	0.27	0.22	0.48	0.41	16.50***	1.16	4.90*	6.07*
		S.D	0.45	0.42	0.50	0.49				
	Mechanisms:									
4a	Temporal Frames:	Mean	0.09	0.16	0.31	0.25	15.67***	1.79	5.64*	3.84*
	Past & Future	S.D	0.29	0.37	0.46	0.43				
4b	Linguistic Frames: Metaphors	Mean	0.24	0.49	0.50	0.44	15.56***	5.61*	5.86*	0.25
	Metaphors	S.D	0.43	0.50	0.50	0.50				
4c	Symbolic Frames:	Mean	0.71	0.59	0.64	0.65	1.78	2.87	1.59	1.29
	Utility Value Claims	S.D	0.46	0.50	0.48	0.48				
4c	Symbolic Frames:	Mean	0.18	0.29	0.57	0.46	43.51***	2.84	9.37*	6.52*
	Status & Exclusivity Value Claims	S.D	0.38	0.46	0.50	0.50				
4c	Symbolic Value Claims:	Mean	0.18	0.49	0.24	0.25	12.65***	8.19*	1.75	6.43*
	Fashionable Value Claims	S.D	0.38	0.50	0.43	0.43				

* p < .05; ** p < .01; ***p < .001.

Comparisons of mean instances of codes in ads across periods. Analyses based on one-way analysis of variance. Post hoc analyses based on Tukey HSD tests.

APPENDIX: Illustrative Watch Journal Advertisements

a) Precision Craftsmanship Period (pre-1983)

"Super accuracy is only half the story.
The GP Quartz Watch is rugged & carefree as well."

"Is it any wonder that experienced professionals have faith in the waterproof qualities of their Omega?"

b) Fashion Period (1983-1989)

c) Luxury Peirod (1990-2008)

"You never actually own a Patek Phillippe,
You merely look after it for the next generation."

"Class is forever."
(Rolex)